TEORIJA IN PRAKSA UREJANJA PROSTORA

IGRA USTVARJALNOSTI

THE GREATIVITY GAME

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THEORY AND PRACTICE OF SPATIAL PLANNING

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CREATIVITY GAME

THEORY AND PRACTICE OF SPATIAL PLANNING

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I.

UVODNIK

EDITORIAL

Alenka Fikfak, Alma Zavodnik Lamovšek
TRETJA ŠTEVILKA

3RD ISSUE

Tretja številka revije Igra ustvarjalnosti je sestavljena iz treh delov. Prvi del je tematski in se nanaša na poglavje Teorija preko sistemov kompozicije (ang. 'Theory by Design Systems'). Več o tematskem delu lahko si preberete v posebnem uvodniku.

Drugi del je namenjen širšemu naboru prispevkov, ki pa so tudi tokrat prispeli predvsem iz vrst mladihso jih tudi tokrat prispevali predvsem mladi, ki se šele preizkušajo na svoji raziskovalni poti. Teme, ki jih obravnavajo, so raznolike in kažejo na zelo različne vsebine in področja grajenega okolja. Ne glede na njihovo raznolikost pa je vsem skupno, da iščejo nove ali preizkušajo stare metodološke pristope na nov, svež način.

Prva dva prispevka tako obravanavataobravnavata različne metodološke pristope k planiranju (Jernej Vidmar, Janez Koželj, Prilagodljivi urbanizem: pristop s parametričnimi kartami in Jošt Berčič, Stanje na področju vključevanja javnosti v prostorsko načrtovanje v Evropski uniji: vključevanje javnosti v prostorsko načrtovanje med teorijo in prakso). Sledita dva prispevka, ki obravnavata vedno aktualno temo mestne prenove in v predlaganih rešitvah vpeljeta tudi možne finančne instrumente (Maurizio Bradaschia, Staro pristanišče mesta Trst: Stoletje stoletje projektov in predlogov za nerešen problem, Kristijan Lavtižar, Ilka Čerpes, John Nash: Regent street: mestna prenova s kraljevo pomočjo). Sledi izrazito načrtovalska tema umeščanja kolesarske poti v urbani krajini (Polonca Andrejčič Mušič, Ilka Čerpes). Zadnja dva prispevka, pa se podrobno ukvarjata s konstrukcijami rešitvami. Prvi na ravni stavb (Andrej Mahovič,

The third issue of the Creativity Game journal consists of three parts. The first part is thematic and relates to "Theory by Design Systems". Learn more about the thematic part in a separate editorial.

As in the previous issues, the various papers in the second part were submitted by young people who are yet to be tested in their field of research. They cover a wide range of topics and fields related to the built environment. Regardless of their diversity, what these topics seem to have in common is a new and fresh take on pursuing new methodological approaches, while testing the old ones.

The first two papers discuss various methodological approaches to planning (Jernej Vidmar and Janez Koželj: Adaptive Urbanism: A Parametric Maps Approach; and Jošt Berčič: The State of Public Participation in Spatial Planning in the European Union: Public Participation in Spatial Planning between Theory and Practice). They are followed by two papers dealing with the perennial topic of urban renewal, while the proposed solutions also discuss the potential financial instruments (Maurizio Bradaschia: The old port of Trieste: A Century of Projects and Proposals for an Unresolved Issue; Kristijan Lavtižar, Ilka Čerpes, and John Nash: Regent Street: Urban Renewal with Royal Support). This is followed by a spatial planning topic of integrating bicycle traffic into the urban landscape (Polonca Andrejčič Mušič and Ilka Čerpes). The last two papers deal extensively with design solutions – the first one, at the level of buildings (Andrej Mahovič: Typology of Retractable Roof Structures in Stadiums and Sports Halls); while the second one,

Tipologija premičnih strešnih konstrukcij stadionov in športnih dvoran), drugi, na ravni infrastrukturnih objektov, pa se nanaša na oceno stanja železniških jeklenih mostov s pregledom metodologij za oceno preostale življenjske dobe (Gašper Rus, Samo Saje, Gašper Šmid, Martin Klun, Jernej Nejc Lombar, Jan Ratej, Simon Weiss, Nejc Demšar, Gašper Cvenkel, Anže CvenkelRus Gašper, Saje Samo, Šmid Gašper, Klun Martin, Lombar Jernej Nejc, Ratej Jan, Weiss Simon, Demšar Nejc, Cvenkel Gašper, Cvenkel Anže).

Zadnji prispevek je neposredno povezan tudi s tretjim delom tokratne številke, ki je kot vedno namenjen predstavitvam natečajev, delavnic ter rezultatov drugega projektnega dela, saj izhaja iz študentskega projekta »Po kreativni poti do praktičnih znanj«. V tem delu je namreč na kratko predstavljenih še nekaj tovrstnih projektov, ki jih je s pomočjo Evropske unije financiralo Ministrstvo za znanost, šolstvo in šport Republike Slovenije. Gre za vrsto zanimivih predstavitev, v katerih so študentje na različne prostorske izzive odgovarjali skozi projektno delo in, ob pomoči mentorjev iz akademske sfere in poslovnega okolja.

Tudi tokrat ste iskreno povabljeni vas iskreno vabimo k branju in pisanju novih prispevkom za naslednjo, četrto številko revije IU_CG, ki bo tokrat obarvana bolj urbanistično in prostorsko planersko.

at the level of infrastructure facilities, assesses the condition of steel railway bridges and reviews the methodologies for assessing their remaining lifetime (Gašper Rus, Samo Saje, Gašper Šmid, Martin Klun, Jernej Nejc Lombar, Jan Ratej, Simon Weiss, Nejc Demšar, Gašper Cvenkel, and Anže Cvenkel).

This last paper is directly linked to the third part of this issue, which again explores competitions, workshops, and other project results; it originates in the student project assignment "Along the Creative Path to Practical Knowledge". This part briefly presents a few other similar projects, financed by the Ministry of Education, Science and Sport of the Republic of Slovenia. This is a range of interesting presentations, where students address a variety of spatial challenges through project work, guided by academic and industry mentors.

You are kindly invited to read this issue and submit new papers for the next, fourth issue of the IU_CG journal, whose focus will be on urbanism and spatial planning.

EDITORS OF THE SECTION

Cristian Suau, Saja Kosanović, Carmelo Zappulla

TEORIJA PREK KOMPOZICIJSKIH SISTEMOV

THEORY BY DESIGN SYSTEMS

"Vsi biološki sistemi (organizmi in družbene ali ekološke organizacije organizmov) so se sposobni prilagajati na spremembe. Toda to prilagajanje ima več oblik, npr. odziv, učenje, ekološko nasledstvo, biološka in kulturna evolucija – glede na velikost in kompleksnost sistema, ki je predmet obravnave. Prilagajanje na spremembe je, ne glede na sistem, odvisno od povratnih zank, ki jih zagotavljajo tako naravni izbor kot tudi posamezne okrepitve. Zato morata biti povsod prisotna proces poskusa in napake ter mehanizem primerjave." (Bateson, 1972)

Na oblikovanje so vedno vplivali zunanji pogoji. Okvir preoblikovanja in vse večja zapletenost oblikovanja se odražata v proizvodih. Ko razvoj kompleksnosti doseže svoj vrhunec, načrtovalec opusti redukcijske in slabo delujoče načrte ter togo in razdrobljeno razmišljanje, kjer je vse razbito na koščke, in sprejme novo zasnovano znanje in delovanje, ki omogočata abstraktne, naprednejše in randomizirane razlage konteksta. Razumevanje projektiranja tako presega poenostavljene, linearne razlage.

Celovitost je odnos do razumevanja sveta v vsej njegovi kompleksnosti občutljivih medsebojnih odnosov. Oblikovanje je neločljivi del celote. Sprememba paradigme ni antropocentrična; človeštva ne ločuje od drugih vrst in narave, temveč ga vključuje v naravni sistem. Zato moramo oblikovanje razumeti kot del naravnega sistema in vzpostaviti širše razumevanje njegovega odnosa do okolja. Geometrični, prostorski, umetniški in funkcionalni vidiki skupaj predstavljajo izhodišče oblikovanja. Poleg tega na proces vplivajo zunanji dejavniki, tj. družbeni, okoljski in ekonom-

"All biological systems (organisms and social or ecological organizations of organisms) are capable of adaptive change. But adaptive change takes many forms, such as response, learning, ecological succession, biological evolution, cultural evolution, etc., according to the size and complexity of the system which we choose to consider. Whatever the system, adaptive change depends upon feedback loops, be it those provided by natural selection or those of individual reinforcement. In all cases, then, there must be a process of trial and error and a mechanism of comparison." (Bateson, 1972)

Design has always been influenced by external conditions. Transformative context and its growing intricacy have constantly been expressed by design products. When the evolution of complexity arrives to its culmination, the designer leaves reductive and dysfunctional schemes, rigid mind-sets and fragmented way of thinking where everything is broken up into bits, and adopts new maps of knowledge and doing which enable abstract, sophisticated and randomized interpretations of context. The understanding of design thus extends beyond simplified, liner-based interpretations.

The wholeness is an attitude for understanding the world in its complexity of delicate interrelationships among parts. Design is the inseparable part of a whole. The paradigm shift is not anthropocentric; it doesn't separate humankind from other species and nature but integrates it inside the natural system. Therefore it is necessary to think of design as part of the natural system and to establish a broader understanding of its relationship with the environment. The geometrical, spatial, artistic, technical and functional aspects altogether

ski pogoji. Oblikovanje je vedno rezultat prizadevanj, da bi notranji in zunanji dejavniki delovali vzajemno. Če je oblikovanje sistem med seboj povezanih značilnosti, potem se moramo zavedati, kako pomemben je razvoj novih oblikovalskih orodij, ki nam pomagajo pri reševanju njegove kompleksnosti. V oblikovanju je pomembna sposobnost soočanja z družbenimi, okoljskimi in ekonomskimi vprašanji. Ali smo sposobni izvesti projekt, ki uspešno združuje estetske in tehnične značilnosti z okoljsko in družbeno kompleksnostjo? Kako se posamezni projekti prilagajajo nelinearni dinamiki vseh sprememb? Kako vzpostaviti ravnotežje med potrebo po trajanju ter vse hitrejšim preobrazbam na splošno? Ali lahko projekt simulira kompleksni razvoj in izboljšanje naravnega sistema? Ali v tej simulaciji »ljudsko« pomeni več kot le nostalgični spomin?

ZAKAJ POSEBNA ŠTEVILKA O TEORIJI PREK KOMPOZICIJSKIH SISTEMOV?

Kompozicijski sistemi prepoznavajo ovire, omejitve in potenciale z raziskovanjem ogroženih okolij ali okolij z vizijo, nizke in pametne tehnologije ter zahtevnih pravil prostorske igre. Kompozicijski sistemi, za katere je značilno sistemsko razmišljanje, prilagodljivost in igralnost, raziskujejo nove zmogljivosti prostorskih sistemov za ustvarjanje novih in alternativnih scenarijev bivanja prek političnih gibanj, ekoloških popravil, okoljskih sinergij in strukturnih gibanj. Ker kompozicijski sistemi temeljijo na eksperimentalizmu – torej so usmerjeni v prihodnost, ne v preteklost – se ves čas soočajo z nedoločnostjo.

CILJI IN VSEBINE

Članki, ki so del te posebne številke revije Igra ustvarjalnosti, ponujajo razmislek o pojavnih oblikah ponovnega odkrivanja oblikovanja v grajenem okolju; podpirajo proces projektiranja v kontekstu prakse v primerjavi z akademskim svetom; premostijo prepad med radikalnim delom, sistemi povezovanja in projektiranja; razširjajo zavedanje o univerzalnem oblikovanju, pristopu 'vsi smo oblikovalci', odprti arhitekturi in sistemskem razmišljanju; izboljšajo atribute vpogleda, razumevanja in poznavanja celotnega načrtovanja kot radikalne proizvodnje, ki temelji na procesih; in raziskujejo dialog med kognitivnimi in čutnimi izkušnjami kompozicijskih sistemov v odprtem projektiranju.

PREGLED ČLANKOV

Razprava o koristih sodobnega pedagoškega sinergijskega formata, ki jo predstavlja **Olga Ioannou**, vključuje tako učenje prek spleta kot učenje v učilnici, ki je slikovito podprto z ugotovitvami eksperimentalnega predmeta Metodologija arhitekturnega oblikovanja, ki se je izvajal lani spomladi na Nacionalni tehniški univerzi v Atenah. Avtorica pokaže potrebo po ponovnem oblikovanju predmetov arhitekturnega projektiranja z uvedbo novih spremenljivk učenja ter s spreminjanjem obstoječih.

Avtor **Velimir Stojanović** v svojem prispevku razišče vzroke in posledice ciklusa sprememb urbane morfologije v urbani teoriji in praksi. Ciklusi

represent the groundwork of the design process. Moreover, this process is influenced by outer factors, such as the social-environmental-economic context. The production of design is always the outcome of an effort to make internal and external characters interacting with each other. Hence, if the design is a system of interrelated features, then we should accordingly acknowledge the importance of developing new design tools enabling us to deal with its complexity. Designing requires the ability to cope with social, environmental and economical issues. Are we really able to produce a project which successfully integrates aesthetic and technical characters with environmental and societal complexity? How does a single project adapt to non-linear dynamics of overall changes? How do we establish a balance between the necessity to last and overall accelerating transformations? Can a project simulate the complex evolution and refinement of a natural system? In this simulation, does vernacular mean more than a nostalgic remembrance?

WHY THIS SPECIAL ISSUE ON THEORY BY DESIGN SYSTEMS?

Design Systems identify obstacles, constrains and potentiality by exploring either endangered or visionary environments, low or smart technologies, and challenging spatial game plans. Characterised by systemic thinking, adaptability and playability, Design Systems are able to explore new capacities of spatial systems to invent and fabricate alternative scenarios for dwelling through political drifts, ecological repairs, environmental synergies and structural manoeuvres. Being based on experimentalism, and rather prospective than retrospective, Design Systems continuously face the indeterminacy.

AIMS AND SCOPES

The papers contributing to this special issue of the journal Creativity Game aim to: reflect on manifestations of design (re)making in the built environment; underpin the design process over outcomes within the context of practices versus academia; bridge the gap between radical oeuvre, interfacing and design systems; discover and define new spatial concepts in the process of (re) making; augment the awareness of universal design, 'we-all-are-designers' approach, open source architecture and systemic thinking; elevate attributes of insights, understanding and knowing of total design as process-driven radical production; and to explore the dialogues between cognitive and sensorial experiences of design systems in open design studios.

OVERVIEW OF PAPERS

The discussion on benefits of a contemporary pedagogical synergic format involving both online and in class learning, picturesquely supported with findings of experimental course Architectural Design Methodology, implemented last spring at the National Technical University of Athens, is presented by **Olga Ioannou**. The author demonstrates the need to reconceptualise architectural design courses by introducing new learning variables and renegotiating the existing ones accordingly.

Author **Velimir Stojanović** explores in his manuscript the causes and consequences of the cycle of changes of urban morphology in urban theory and practice. Cycles of change in urban morphology have a historical dimension

sprememb v urbani morfologiji imajo zgodovinsko razsežnost, ki vpliva na spremembe preteklih in sedanjih morfoloških pogojev. Pri tem avtor razloži odtujitev tokov in trendov preteklega obdobja.

Minas Bakalchev in soavtorji **Sasha Tasic**, **Violeta Bakalchev** in **Mitko Hadzi Pulja** analizirajo pojav urbanih linij kot sistemov, ki povzročajo soodvisnost, vzajemno pogojenost in zaviranje, ter pri tem ugotavljajo določeno logiko nadzora. Članek predlaga projektne strategije iz arhitekturnega studia »Residential Transformations«, ki je akademski odgovor na obravnavano temo.

Vrhunec posebne številke »Teorija prek kompozicijskih sistemov« je pregled, v katerem avtor **Maurizio Bradaschia** predstavi odnos med projektom in teorijo v vidikih, ki označujejo večja gibanja zgodovinskega mišljenja; te paradigme so koristne za usmerjanje znanstvenega raziskovanja in vseh drugih vrst raziskovanja.

VIRI IN LITERATURA

Bateson, G. (1972). Steps to an Ecology of Mind. San Francisco: Chandler Pub. Co.

effecting the change of both the last and current morphological conditions. In doing so, the author explains the alienation of historical flows trends.

Minas Bakalčev and co-authors **SašaTasić**, **Violeta Baklačev** and **Mitko Hadzi Pulja** analyze the phenomenon of Urban Lines as systems that create inter-dependences, inter-conditionalities and suppressions, experiencing in their traces certain logic of control. All in all, the paper proposes project strategies from the studio 'Residential Transformations', as academic answer to the topic.

This special edition called **"Theory by design systems"** culminates with a review in which the author Maurizio Bradaschia presents the interaction between project and theory in the perspectives that characterize great movements of thought of historical period; these paradigms are useful to guide the scientific and every other type of research.

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II.

ČLANKI

ARTICLES

THEORY BY DESIGN SYSTEMS

Maurizio Bradaschia: DEFINICIJA PROGRAMA, KI OPISUJE ARHITEKTURNI PROJEKT

THE DEFINITION OF A PROGRAMME THAT ELABORATES AN ARCHITECTURAL PROJECT

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The definition of a programme, elaborating an architectonical project, is the first step that a designer takes to solve a complicated problem, giving multiple and many answers, to reach one of the possible synthesis: the project.

There are many ways and possible methods.

It's not easy to summarize a method. Usually, before the installation of a program, you have to know the project theme and the context in which it will be realized. The acquisition and implementation of this knowledge can be obtained through direct researches (surveys, evaluations, etc.) or indirect researches (documentary researches, archive surveys, library, etc.) and morphological and typological analysis of the context being transformed.

Context, as reminded by Ludovico Quaroni in Analysis and project of his "A building project. Eight lessons of architecture." referred to physical and human reality (but political as well) of the environment.

Part of the programme are also, of course, all those preliminary data, inferable from the superior regulation and from urban planning restrictions existing on the transforming area, but this is not the aspect that has to be developed.

What seems more important is the type of the existing urban fabric, which characterizes the context in which the project is inserted, as the town plan, as dimensional relationships between solids and voids (of the building, of the façade, etc.), between the length of the streets and the height of the perimeter continuous facades, … substantial questions, especially in the case of the historical context which characterizes most of the Italian regions, and that of many other countries, not only in Europe.

Also, the belonging to a specific historical or stylistic period, the features of the urban shape (trivialising: considering the case of cities like Venice, Rome or Trieste, characterized by an explicit neoclassic koinè, or the colonnades in Bologna, the great boulevards of Paris, the slums of Lagos, Beijing,… despite an exportable method, the approach is, necessarily, different). And also: the morphological survey, the architectonical emergency, the presence of specific typological characteristics , which are the face, the nature and the substance of a context.

Typological characteristics which don't exclusively refer to dimensional shapes, spaces and relationships, but also to building techniques, to technologies more or less locally used, etc.

However, these analyses shouldn't be misunderstood, or they shouldn't lead to dangerous paths like the one of the "mimesis", of the "philological rescue" of the pre-existing features, of the "historical counterfeit".

These analyses also have to let the architect create a correct and coherent reference framework, from which his own project starts or, maybe, deny the context and its characteristics.

The intrinsic historical memory of a place can actually suggest the structure of a project hypothesis, through an accurate analysis of the morphological and typological characteristics of the settlement context.

For example, in continuity with the pre-existing features and to give value to the environmental morphological factors, the study of the physical-environmental and geometric-settlement conditions can determine the choice of a specific typical-morphological shape of the building or of the building materials used, and this choice would be determined by perceptual and visual factors of the environment (margins, barriers, views, emergencies) or of the surrounding landscape (urban, suburban, …) or by the prevalent trend.

We have to say, though, that indications and suggestions given by the history of the place or by the place itself are not fundamental restrictions for the project, but they are important, recognized elements, an useful and necessary component of consideration, which can make up architect's mind, and can make him get the permanent features and (re)interpret them.

Therefore, the architect has the responsibility of suggesting or realizing the project, after reading and interpreting collected data, following his own inclination, culture and experience.

It's not just an "aesthetical" question (on which was based the representative will of political classes, who contribute to the configuration of the historical city), but it's more a question relied to the concept of cultural sophistication.

Project is, however, subjected to the idea.

It's almost every time the creature of an idea which, growing up during an indefinite and indeterminable period of time, develops itself in the architect's mind, until it finally becomes one or more sketches, synthetic and instinctive, in one go, which first define the idea.

The sketch (no matter if good or bad) is a revealing tool, a knowledge tool. Usually, drawing is, for an architect, for an engineer or for a designer the starting point of a survey.

The sketch helps understand, perceive and organize the different scaling ups of the project.

An example: drawing, representing with sketches a city, you can redefine its systems, the urban rules, and represent its historical evolution. Drawing helps, it's an excellent tool to define a shapeless place, or a not very defined one.

Architecture can be referred to as a crossbreeding of drawing, thoughts and writing.

Many designers write a lot. In their works the first step is often that of understanding how to define, in a "literary" way, the project, through words and emotions, as Aldo Rossi used to do. The Architect was interested in writing and in building.

Once this phase of drawings and sketches is done, hanging between the literality and the drawing, the building starts to be thought as construction.

I think that the execution of many preliminary sketches, many conceptual models, and representing the idea through spatial forms and diagrams is fundamental. Starting from a programme, previously planned, defining the "outline boundaries", the meta-project pre-conditions, to better understand client's needs.

And the realization of a functional scheme is fundamental as well, to define functions' organogram; it also allows spaces and connections between them to be balanced.

Then, it's time for a volumetric drawing, for the definition of the three-dimensional space, through the CAD drawing, followed by other sketches, to correct errors and make the necessary adjustments.

The final step is the definition of the project on computer.

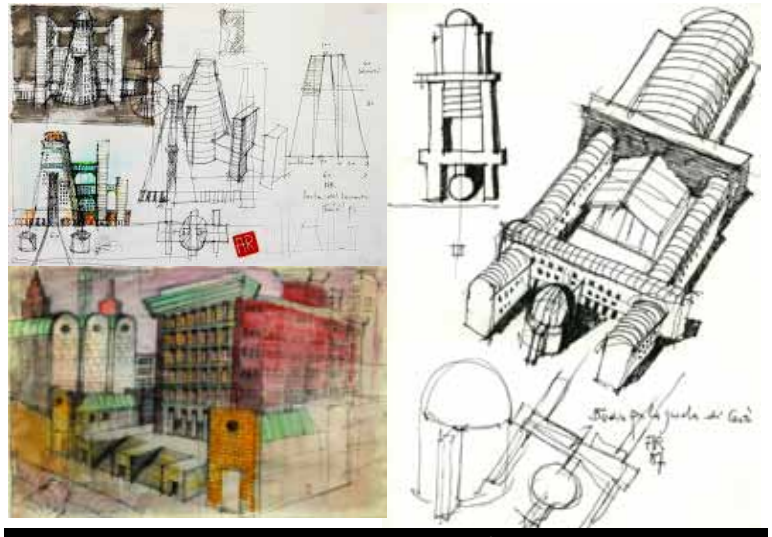


Figure 1: Aldo Rossi: Disegni 1980-1996, Porta del Levante, 1993, foto: Andrea Corbetta (top); 2. Aldo Rossi: Fukuoka, 1987, foto: Andrea Corbetta (bottom); Aldo Rossi: La nuova palestra di Cantù, 1994, foto: Andrea Corbetta.

But the original idea of the project, after all, is fixed in the meta-design sketch. The sketch, the freehand drawing is more expressive, more human, and true.

I think that's very important to reflect on the project, think about it, before doing anything else.

The use of different methods can be helpful: freehand drawings, the renderings, the creation of models can help to better understand proportions, volumes and the project theme.

Sketches and drawings allow to think about something that oversteps the building – not exclusively as Aaron Betsky meant – something that anticipates its conception.

The concentration on the relationships between mind and hand is fundamental. Freehand drawing is exactly what you want, on a piece of paper.

The project process and the creation of the building can be linked to every phase between the idea (of the project) and the accomplished work.

They include the meta-design sketches, the collection of data and hypothesis that lead, with survey and analysis graphics, to the prefiguration of the first drafts of what will become the design. Design which, developed on various scales, will lead, with the executive project, to the readiness and realization of the work, under the supervision of one or more people who, as directors of the work, will follow every step of its development, from the artistic, architectonical, technical and constructive, technologic and economic point of view, to accomplish the work under the artistic-architectonic aspects.

Provided that Architecture (and every other discipline which calls for a synthesis elaboration) is, as Hannes Meyer used to say, "a problem of knowledge", there are many and different methodological approaches that lead an architect to the realization of a project.

One of these, still possible and credible, is with every possible update, the one drawn by the same in 1928 and which, starting from twelve points/themes:

1. Sexual life, 2. Sleeping habits 3. Pets, 4. Gardening, 5. Personal care, 6. Weather protection, 7. House care 8. Car maintenance, 9. Cooking, 10. Heating,11. Exposure to sun, 12. Services, pointed the reasons for the building of a house.

Meyer thought that, analysing someone's everyday routine, it's possible to obtain a functional diagram on which the project should be planned.

The two main principles of building were the functional diagram and the economic programme.

The economic programme still remains, now more then ever, one of the reasons that rule the feasibility of any project.

The functional diagram is a valid starting point for the design of a work. It's, essentially, the creation of a group of quadrangular or rectangular shaped surfaces, which represent the dimensions in scale of the functions/purposes of the spaces of the building.

These surfaces will be linked between each other, highlighting ways and possible connections to organize the series of volumetric/planimetric spaces which will dimensionally make the building up.

It's a very simple and schematic procedure which, following similar logics, can lead, already from the beginning, to very different and varied solutions.

Different because it's different the importance that every single architect gives to spaces and functions inside of a given architectonic type, regarding many different possible questions (geographic location, nature of the place, culture, building system, uses, etc.).

This method, very common in Engineering faculty, is not very developed in architecture schools, maybe because of the (unfounded) fear of an excessive and reductionist schematization of the project.

Another approach is geometry.

I personally would point out two fundamental pillars of geometry, as project tools: the first one, out-dated, referred to the research of reasons and proportions linked to harmonic relationships (golden ratio, etc. ..); the second one, very popular from the beginning of 80s, referred to the context "structure geometries".

Talking about the first one, which can remind a conception of project typical of the Vitruvian triad, was very popular until the end of 80s.

Utilitas, *firmitas* and *venustas* are the categories that we have to refer to.

The plan [1], which generates the project, is the place where the game was played.

Utility, solidity and beauty were considered, almost by everyone, necessary and essential principles for the project.

Questions and themes that could have been seen in different ways, and then (re)interpreted and adapted to the contemporary, to realize "useful", "solid" buildings, and though not "beautiful", congruent with the theme, appropriate, correct.

The architecture, in many authors' point of view, could be expressed through the synthesis of these concepts.

And they could still be interesting, nowadays, if put in the right light: utility, compliance and congruence with the theme are the basis of every project operation, especially nowadays, where planet "urgencies" require less wastage and useless wasting of areas. Designing and building have to be useful for the community.

Buildings don't have to be firm and solid just to comply with rules and requirements of the building science, but they also have to last in time, maintaining the original quality characteristics. They have, therefore, to be conceived, designed and realized in a way to reduce maintenance and repairing costs.

Too much should be said about beauty (and, as Lina Bo Bardi said, a possible Right to the ugliness).

The key issue is, though, pertinence, accuracy, adequacy, maybe elegance, maybe an aesthetic solution as well. As said by many, adequacy to the time, to the contemporary zeitgeist, to the context (both natural and artificial), to the raumgeist.

It would be very useful to read what Luciano Semerani wrote about this subject, about the "regulatory line " [2] in Lessons of Architectonic Composition, Arsenale, Venezia, 1897:

"The general issue is the regulatory line. Talking about what is conventio-

1 Cfr. The Plan: Le Corbusier, Toward an Architecture, 1920-21:
THE PLAN
The plan is the generator. Without plan, you have lack of order and wilfulness. The plan holds in itself the essence of sensation. The great problems of tomorrow, dictated by collective necessities, put the question of "plan" in a new form. Modern life demands, and is waiting for, a new kind of plan, both for the house and the city.
2 The general issue is the regulatory planning. Talking about what we called the "invisible structure of the architecture", after the plan and the type we have added this: the regulatory planning.
Strictu sensu the regulatory planning is an empirical tool of the project; it shouldn't be so much important. It's a graphic device to empirically control the connection between architectonic elements. It has to be distinguished from the harmonic proportion, which is not the result of an empirical discovery, but it's just the application of a canonical rule. The truth is, however, that debates about numbers, the question of the regulatory planning, the question of the harmonic proportion, they all together come from the conviction of "finding" or "applying", or of "acting" following the rules, not just scientific or classic, but universal.

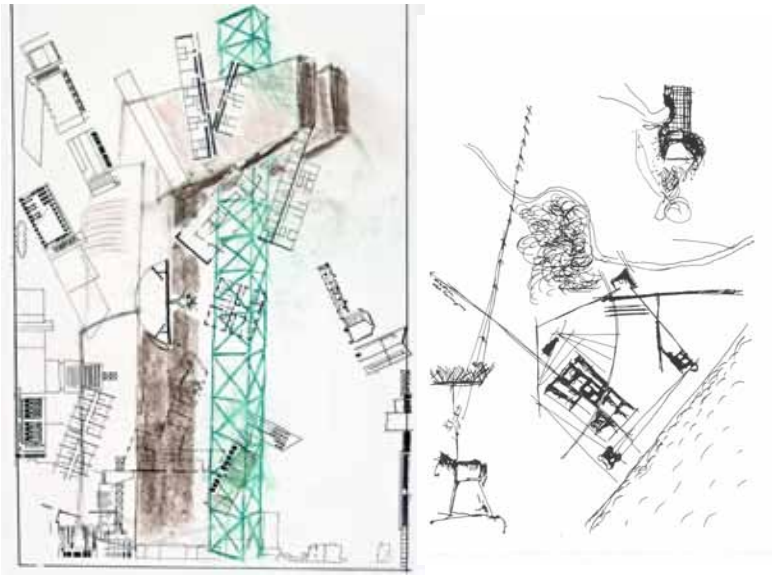


Figure 2: Luciano Semerani: Pesaro Programma, 1977.

nally called "invisible structure of architecture", after the plan and the type there's the regulatory planning.

For Semerani, this term can be better applied to the first method, to an architecture based on (but not only) harmonic relationships between the parts, to an "Albertian [3]" vision of architecture, based on "concinnitas", to a relationship in which all the elements depend from each other.

The method developed by Le Corbusier in "Regulatory lines", in Towards an Architecture (1929-21):

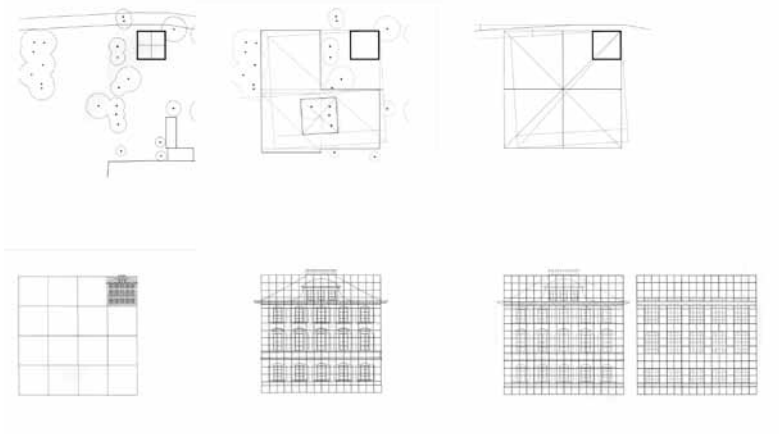
REGULATORY LINES

The fatal born of architecture.

The commitment to order. The regulatory line is a guarantee against the free will. It's the joy of the spirit.

3 Leon Battista Alberti: "De re edificatoria", IX, book chap. VI (prima ed. 1485).
"... the method we're analysing is based on three main laws: the number, what we mean by saying delimitation, and the collocation. And then, there's another element, which is the result of the connection and the union of all these elements: the shape of beauty shines in it, and we will call it CONCINNITAS, ..."
In Paolo Carpeggiani's point of view, "Leon Battista Alberti transfers to architecture every concern on which his philosophical speculations were based, the method in which every axiom is rejected, everything is verified, it's the will of overcome all the stereotypes.We can see that in his monumental work De re aedificatoria (1443-1452), which has become a real theoretical paradigm in modern age. He elevates architecture, which won't be ars mechanica anymore, to the rank of ars liberalis, he requires the intellectual architect to be able, with a sure and perfect method, to rationally design and practically realize". Project's goal is the beauty of the manufactory and its basis is the concinnitas, "the harmony between every part, in the unity they all take part to, based on a definite rule, so that any change or removal or adding can but change the project in a bad way".

Figure 2: Richard Meier – Decorative Arts Museum, Frankfurt, Germany (1979-85).



The regulatory line is a mean, not a recipe. The choice and modality of expression of the line are integral part of the architectonic creation.

This corbusian "method" was born in '80. The new importance given to "diagrams", opposite to the old concept of "type", makes the architectonic "composition" the most important tool for the architect. The architectonic composition is given the task to solve the question between shape and programme, between shape and function to somehow solve the architecture. JNL Durand said that the first aim of architecture is not the imitation of nature, or the search for the pleasure and aesthetic satisfaction, but the composition, or disposition.

This theory, suggested by Durand, is based on a rigorous compositional method, based on a geometry of axes, to which regularity and symmetry has to be proved, drawn on a grid.

Durand suggests two tools: the undifferentiated grid and the axis.

The modular grid substitutes the old project models of Renaissance and stands out as rigorous designing method based on geometry. This is a scientific method, that reject Laugier's idea about the origins of architecture, and which stands with an attitude of strong scepticism towards history.

The second method attributable to geometry is very simple: starting from various nature arrangements, we set up different gratings which lead, in the plan on in 3D, to the structure of the project.

Nowadays, many historical projects by Richard Meier are the best example to explain this method, starting with Decorative Arts Museum in Frankfurt (1979-85) where a geometric lecture of the pre-existent building leads the author to re-design and structure the new factory, following neo corbusian logics [4].

4 The project contains all the five points of the Corbusier's Architecture, starting with the promenade architectural, which influences the whole project trough meanings and suggestions.

Figure 2: Richard Meier – Getty Center, in Los Angeles (1984-1997).

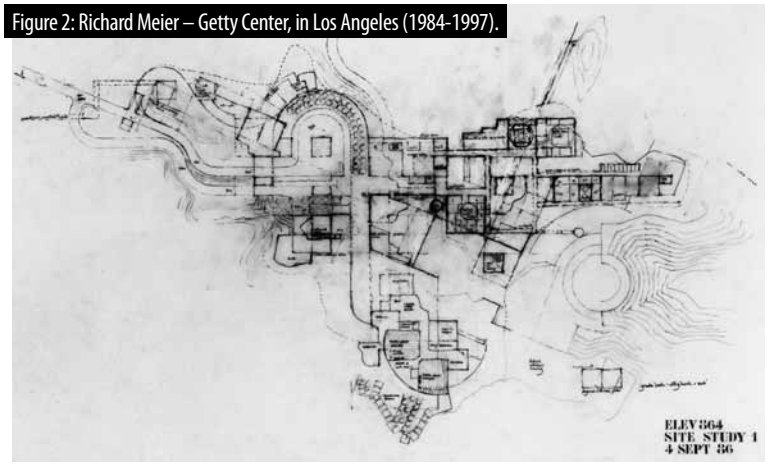


Figure 2: Peter Eisenman - Park or for the Check Point Charlie.

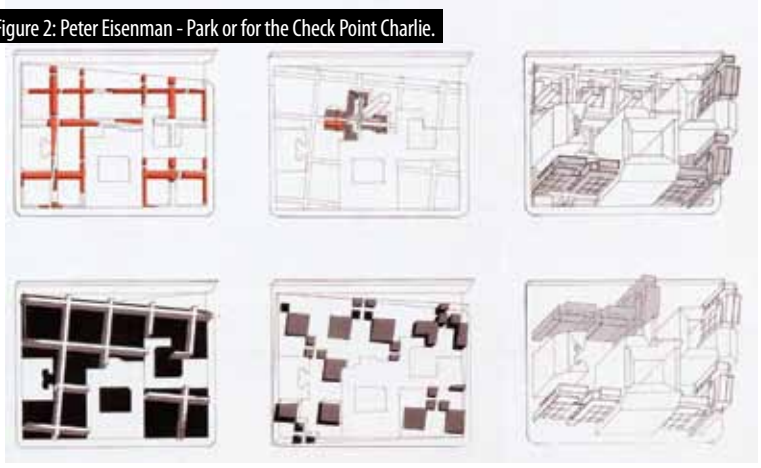


Figure 2: Zvi Hecker - Heinz Galinski School, Berlin; Germany 1995.

Project complies with the typology of the pre-existent Doppelvilla, and the planimetric organization is the result of the intersection of two geometries: the orthogonal grid of villa Metzler and a second grid, which follows the trend of the river Meno.

Villa Metzler is absorbed by the new complex and corresponds to one of the sixteen squares of the new grid, which orders the whole complex.

The other axis, perpendicular to the river, generates a new grid of the same size, but rotated three and a half degrees, overlapped to the one aligned with the villa. -The formal order of the whole structure derives from this grid

Figure 3: Daniel Libeskind - Hebraic Museum, Berlin.

Figure 2: Idis Turato and Sasa Randic - Nursery in Veglia on the island of Krk, Croatia.

Figure 2: Ben van Berkel - Möbius house. 1993, Amsterdam, Nederlands.

overlapping.

The proportions and the dimensions of the holes in the façade are dimensionally evoked to define the modularity of the cladding panels of the new structure.

Here is a very significant example that allows to understand the importance of the "grid" during the predisposition of a project: the great complex of Getty Center, in Los Angeles (1984-1997), where Meier characterizes two axis, planimetricaly rotated twenty-two degrees and a half, corresponding to the two motorways (San Diego Freeway) which are around that area in LA.

The key concepts of the Getty Center project are : Context, Geometry, Structure, Circulation, Outdoor spaces, Landscape.

This geometric system doesn't characterize just the "classicist" approach of neo-modernists and the well-established project approach by Richard Meier, but also that of other authors, methods and systems.

For example, many projects by Peter Eisenman in 90s, or the one for Rebstock Park[5] or for the Check Point Charlie and the Max Reinhardt Haus in Berlin, in 1996, where geometries are multiplied in the space and they're not just material, but immaterial as well: Eisenman himself talks about planes routes that overfly Berlin's sky as new possible paths that could inspire new geometries and architectures.

The regulatory line is enriched, in Eisenman's project, mostly since 90s, by geometries attributable to the concepts of folding and morphing.

The volumes of Eisenman's new projects' buildings are the result of extrusions on fragmented lines that overlie and intersect each other, they fan with various rotations or on different vertical sections, they follow the mechanism of genetic fractals, they develop the issue of the wasted spaces, they result as minerals come to light following sudden telluric movements, they elaborate the topic of the presence-absence of a virtual geometry.

His previous work was based on the Euclid geometry, while later on sinuous, fragmented, bended shapes of fractals (mechanically generated by calculators or discovered in minerals and vegetables), on the geometry of Boolean differences, or on the topological one of the areas' grids.

The theoretical role played by Chomsky in 60s is replaced with the one of Jacques Derrida and the reflexion on the "text" moves from the syntactic absoluteness of the first phase to an interstitial research ("in between"), in which the purpose is the "variety" of meanings, the surprise, the "destabilization".

To be fair, talking about architecture, starting from other considerations (always related, however, to space and geometry experimentations), we can identify in both Formspiel by Wassili Luckardt [6], 1919, and in Weimar by

5 For Rebstockpark, the main conceptual element of the plan is the fold, result of the mathematic model of the concept of fold in chaos theory by René Thoms, and of the fold concept of Gilles Deleuzes. The orthogonal organization system is replaced, in the project, with a system that exceeds the right angle. The surrounding ground has been shaped by two grids, each of which is a torsion of one of the Cartesian plans used to define the limits of the lot. The relationship between the single buildings and between buildings and empty spaces is determined by the fold.

6 From Treccani Encyclopedia: "Luckhardt Wassili – German architect (Berlin 1889 – 1972); he worked with his brother Hans (Berlin 1890 – Bad Wiessee, Bavaria, 1954). Grown surrounded by the Berlin expressionist vanguard, he joined, with his brother, the Arbeistrat für Kunst (1918), to the Novembergruppe, to the Gläserne Kette of B. Taut, and realized idealistic projects which exalt the qualities, the symbolic ones as well, of new materials, especially the glass. From 1924, in cooperation with A. Anker, they focused their research on models for residential construction industry, on the analysis of the problem of the minimal accommodation and on the study of urban-scale interventions (experimental Siedlung in Schorlemer Allee, Berlin, 1925-27; single-family detached homes in Berlin-Rupenhorn, 1928; project for the reconstruction of the Alexanderplatz in Berlin, 1929). After the end of the Second World

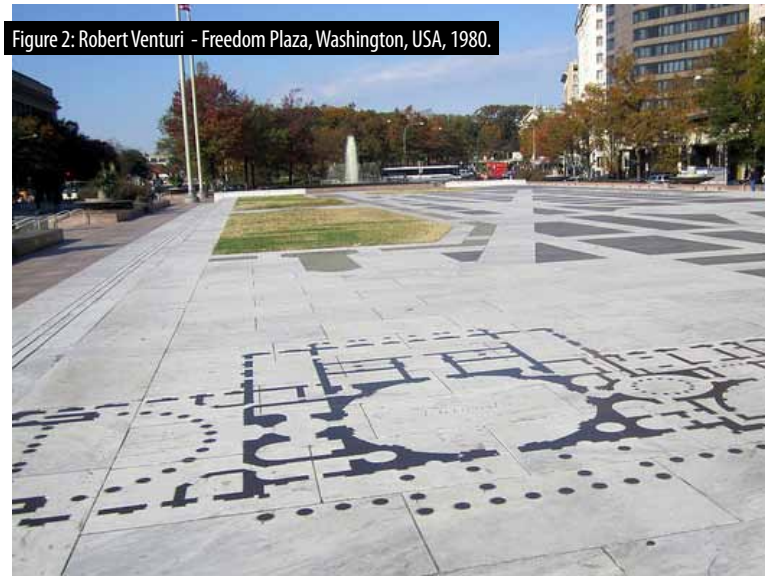


Figure 2: Robert Venturi - Freedom Plaza, Washington, USA, 1980.

Figure 2: Peter Eisenman - theatre for Bruges (top) and the big project for Santiago de Compostela (bottom).

Walter Gropius (1920-22), two archetypes of eisenmanian experimentations.

Geometry, the "regulatory line" is also the basis of all Daniel Libeskind's works.

An very important example is the Hebraic Museum in Berlin, where geometry also plays the role of signifier and signified [7]: Libeskiind called his project between the lines and the voids, which go through the whole museum, are the point where the two lines meet.

Looked from above, the building has a zigzag shape, hence the nickname blitz, that means lightning in German. Its shape reminds of a broken down, destructed Star of David. The building is completely covered by zinc plates and the facades are characterized by very long and thin windows, more similar to lacerations or wounds than to actual windows, randomly arranged.

Zvi Hecker, another Jewish German author, uses similar signifiers and signifieds, starting from geometric rules.

His Heinz Galinski School, the first Hebraic school opened in Berlin after the end of the Second World War, built in 1995, was organized on the open pages of a book; book that doesn't represent just itself, the link with the apprentice, but with the "Scriptures" of Hebraic people.

Another school, the nursery on the island of Krk(Veglia), in Croatia, by Idis Turato and Sasa Randic, is based on geometric reasons. Here the geometric shapes of the dry stonewalls, that characterize the paddocks for sheep farming and, generally, the mean to demarcate the properties, are translated into a planimetric shape.

The pre-existence is evoked and translated trough geometry and also through the conservation of geometric and material relationships.

The nursery, positioned at the edge of the building, appears as a close, introvert island, surrounded by dry stone walls. Inside the complex, conceived as a "nursery-city", paths and empty spaces repeat the shapes and the relationships of the insular village of Venetian origin.

The approach and the theme are different in Ben van Berkel's Möbius.

War, they restart their activity, exemplar expression of the international style of the post-war: city of Berlin pavilion for the exhibition Constructa in Hannover (1951); houses organized in line for the Interbau in Berlin (Hansaviertel, 1957); the Town Hall in Brema (1961-66); the Institutes of Plant Physiology and Veterinary (1963-68) of the Freie Universität of Berlin. We can mention: Zur neuen Wohnform (1930, in collab. with A. Anker) e Lichtarchitektur (1956, in collab. with W. W. Köhler)".

7 The museum doesn't have an independent entrance from the street, you have to enter through the next historical building of Berlin Museum.
The two buildings are linked through a stairway and an underground path, which symbolizes the union and link between Hebraic and German histories. The stairway leads to a basement, made of three corridors, metaphor of different destinies of Hebraic people: the Holocaust axis leads to an empty tower, called Holocaust Tower: the Exile axis leads to an outdoor garden, called Exile Garden, characterized by 49 quadrangular pillars; the continuity axis, linked to the other two corridors, which represents the Jewish stay in Germany despite the Holocaust and Exile. This axis leads to a stairway, which, in turn, leads to the main building. The entrance to the museum is intentionally long and difficult, meant to transmit the visitor the feelings of challenge and extreme difficulty that characterizes Hebraic history.

House, where Möbius strip characterizes the building and its function/use. The diagram itself (the "regulatory line" on which the project is adjusted), transposed into in constructed architecture, represents the life cycle in the daily 24 hours.

In 1993, a Dutch young couple commissioned Ben van Berkel the project of a "house that should have represented an innovation, being the point of reference in architecture panorama". The project, developed in six years, was based on the studies of the famous German mathematician who gave the name to the house. The building, positioned in a residential area in Amsterdam, is surrounded by a green landscape. Ben van Berkel understood that he had a challenge: responding to the personal needs of the young couple, who had its own working life, integrating it with the relational needs: the house had to solve questions about sleeping, socializing, living with the family, about the needs of the single individual. Because of that, time and duration notions were fundamental. The idea was, then, to realize a life diagram during the whole day. The whole scheme was connected to the Möbius strip, which represents the infinite, turning its own faces in a continuous and unlimited curved surface.

Van Berkel could, through Möbius strip, synthetize the agreed programme in the house, integrating it and making it coincide with the structure and the paths inside of the building itself. The movement, through the built continuous slab, goes along with the totality of daily life, the set of activities. The strip, organized on three levels, contains two offices, three bedroom, one common room, a kitchen, a living room, broom closets and a greenhouse on the top. Glass walls integrate the house in the surrounding space. The building is dynamic, it seems in constant movement, thanks to the materials used and its geometry.

The regulatory line, in this case, coincides with a model, a diagrammatic idea, which connects the project itself to the Haus Wittgenstein [8] (1925-28), and to the more recent project operations based on "diagrammatic" rules.

And, also, the basis of the Freedom Plaza's project, in Washington, by Robert Venturi, is based on geometric reasons (less conceptually complex). Here, the floor of the whole Plaza is the on scale- copy of an area of the city. Inaugurated in 1980, the plaza is composed by simple but effective elements: it copies the plan of the city realized in 1887 by Pierre l'Enfant, using a bicolour granite (black and white), with green areas and bronze drawings. It's, somehow, a turned project, compared to the grids used for urban orientations: it's the city the one which is reduced to plaza and the plaza which, representing the city, declares its own belonging to it.

The "geometric" planning, arranged on regulatory tracks, belongs to most of the architectonic planning of history, and has a great influence, more or less emphasized, in almost every author of modern and contemporary ages.

However, it's interesting the answer given by many architects, looking, in non Euclid geometries, for the key or, better, a new project planning: it's the search for the space with an unspecified number of dimensions, as the search for invisible geometries positioned or identified in border, margin or friction areas between adjacent plans. And it's interesting as well the answer that many authors try to give about the individuation of new possible limits and superimpositions between phenomenal world and diagrammatic geometry.

Again, Peter Eisenman's[9] projects are quite interesting, especially two of them: the new theatre for Bruges and the big project for Santiago de Compostela. Eisenman sets the New Theatre in Bruges using tidal streams, here characterized by big ranges, making the building directly arise from the folds in the ground, so that it becomes integral part of the landscape, an element that joins and connects the park and the square. The building, composed by two wings connected with each other in the basement, is completely integrated in the surrounding park. Eisenman, through the use of a new type of regulatory track, introduces a new type of building, rejecting and in opposition with the traditional relationship between ground and building. In Bruges, the Architect cancels this relationship, and the one between building-context: work and context are reunited in a total continuity.

He tries, in the project for the Cultural Centre in Santiago de Compostela, Spain, to realize an even stronger connection between context and architecture: the designer draws three buildings completely integrated to the ground, engraved in the land. The context and the landscape, after overcoming Euclidian geometry, become materials for the construction of the new architecture, a kind of fractal "budding".

Other architects, around the end of '90, use the same fractal budding and give life to the so-called "blob architecture".

Among them, we have to remember Greg Lynn, in whose work the distance between the imaginary and the real is cancelled, creating a liquid and immaterial architecture. He introduced, from the end of 90s, after abandoning the traditional geometry, a new way of conceiving, drawing and representing architecture. Thanks to the architect, architecture became dynamic, lively, starting from the planning conception.

Dynamicity, centrality of the point of view, animation are the basis of a research which, on a design level, abandoned the meta project sketch, to find in mouse and keyboard the new tools with which trying a new, innovative approach to the project.

It's the landscape of the topological geometry [10], the passing of the Carte-

8 The house that Ludwig Wittgenstein commissioned to the architect Paul Engelmann for his sister Margaret, in Vienna, in 1925. The house, finished in 1928, is based on precise numeric relations that control the construction of three cubic blocks placed side by side. Wittgenstein himself took care of it for two years, searching for absolute perfections in harmonic relations between the parts and the whole.

9 "A diagram, in architecture, can be seen as a double system that operate as a scripture, both in the indoor and outdoor spaces of architecture, and in respect to the requirements of a specific project. It acts as surface, which receives inscriptions from the memory of what doesn't exist yet, that means the memory of a potential architectonic object. The diagram functions as agent that focuses the relationship between a subject author, an architectonic object and a receiver; it's the layer between them"Peter Eisenman in: Contropiede, Skira, Milan 2005, page 200.

10 "The topology, or study of spaces (from the Greek τόπος, tópos, »space«, e λόγος, lógos,

sian geometry, which expresses itself in the plurality of new destabilizing spaces.

»study«) is one of the most important branches of the modern mathematics. It's the study of the properties of the forms and the shapes that don't change when a deformation without "tearing", "overlapping" or "gluing" take place. Fundamental concepts as convergence, limit, continuity, connectedness or compactness find their best formalisation in topology.
It's essentially based on concepts of topological space, continuous function and homeomorphism. The same term means as well the collection of open spaces that define a topological space.
For example, a cube and a sphere are, topologically talking, equivalent objects (that means homeomorphs), because they can be deformed one in another without using any gluing, tearing or overlapping; a sphere and a bull, on the contrary, aren't equivalent, because bull has a "hole" that can't be removed from a deformation.
The topologic spaces are daily used from the mathematical analysis, form the abstract algebra, from geometry: this makes topology one the big unifying ideas of mathematics.
The general topology (or point-set topology) defines and studies some useful properties of spaces and maps, as well as their connectedness, compactness and continuity.
The algebraic topology is, on the other hand, a powerful instrument to study topological spaces and maps between them: it assigns them "discreet" invariants (for example numbers, groups, or rings), easier to calculate, often using functors. Algebra and algebraic geometry were highly influenced by the algebraic topology.
The great motivation of topology is that some geometric problems don't depend from the exact shape of the involved objects, but from "the way in which these are connected with each other". For example, the algebraic topology's hairy ball theorem says "you can't comb a hairy ball without creating a cowlick". This is obvious for many people, even though, reading the formal statement of the theorem ("A continuous vector field on a spherical surface has at least one zero") they wouldn't think so.
As for the Seven Bridges of Königsberg, the result doesn't depend from the exact shape of the sphere, but can be applied to irregular spherical forms and generally to every type of object (as long as its surface satisfies some requirements of continuity and regularity) that doesn't have holes.
It's essential, to deal with problems that don't rely on the exact shape of the objects, to clarify what are the properties of the objects that we can count on: hence the notion of topological equivalence. The impossibility of crossing each bridge just once applies to any arrangement of bridges homeomorphic to those in Königsberg, and the hairy ball theorem applies to any space homeomorphic to a sphere. Formally, two spaces are topologically equivalents if one can be deformed into the other: in this case they are called homeomorphic and they are exactly identical. A continuous deformation of a mug into a bull. The continuous deformations are formalized into the notions of homeomorphism and homotopy.
An homeomorphism is usually defined as a continuous bijective function, endowed with a continuous inverse, which is not very intuitive even for someone who already know the meaning of the words used in the definition. A less formal definition clarifies what said before: two spaces are topologically equivalent if it's possible to deform one into the other without cutting or gluing pieces of them. For example, a mug and a doughnut are homeomorphic. An introductory exercise is to classify the uppercase letters of the English alphabet according to topological equivalence. The result is this one:

{A, R} {B} {C, G, I, J, L, M, N, S, U, V, W, Z}
{D, O}{E, F, T, Y}{H, K}{P,Q}{X}
There's a weaker notion of equivalence: the homotopy. Informally, this notion allows transforming objects into each other in a slightly freer way: it's possible, for example, to transform a Q in an O, progressively shortening the foot of the letter Q, until it disappears. We obtain these classes:

{A, R, D, O, P, Q} {B}
{C, E, F, G, H, I, J, K, L, M, N, S, T, U, V, W, X, Y, Z}

This last notion essentially distinguishes the letters according to the number oh holes: {A,R,D,O,P,Q} have one, {B} has two, all the other none. The number of holes is invariant; it's a quantity useful to distinguish objects. This quantity is formally realized through the concept of fundamental group". Source: Wikipedia.

The modelling of the shapeless space and the animation create new possibilities of expression, new ways of the future living.

To be fair, what is theorized and experimented in the initial digital project, and expressed through an astonishing creativity, is missed since the first work realized by the same author: the Korean Presbyterian Church in New York, in which the diagrams are reduced to an usual architecture, "already seen", while it takes form.

The topological geometry was the basis of a very interesting contest that took place in the end of 1990, in which Peter Eisenman, Jean Nouvel, Toyo Ito and Daniel Libeskind grapple with the theme of the "Virtual House".

Virtual house doesn't mean "wired building" with very sophisticated technologies, but it means "creation of new spaces of body and mind". The "virtual house" of this contest is a house in which, through plans, construction and intelligence, it's possible to generate newer connections; the house is set up, organized or inclined to allow the highest potential of unpredicted relationships. It's a space not completely determined by fixed qualities, because it's dynamic and has no limits. Its geometry doesn't come from fixed points. It's characterized by an absolute new virtual space that changes in time to allow shape and movement to be free. It's not predetermined; rules can change depending on what happens in it.

As an obvious result, the four interpretations of the authors are very different between each other.

Jean Nouvel uses a very sophisticated technologic tool: the transposition of a classic model, the Palladio's Villa Malcontenta. In his project, the textures, transparencies and multiple reflections transform the Palladian space, through manipulation of the light.

Toyo Ito's proposal is very different; he doesn't design a virtual house: he thought that such a thing would have been possible only when architecture is be able to eliminate the gap between the unconceivable opposites of space fruition. He decides, then, to design a "temporary" house for his beloved ones. A house with no windows, in which indoor space is the mirror of their existential conditions. The house is synonym of "family place", a temporary house, related to the durance of the family itself (due to the fact that, inevitably, for various reasons, their lives will be separated).

Peter Eisenman and Daniel Libeskind reactions are more technological and less sophisticated. Eisenman introduces an experimentation on the shape, and of the non-shape generated by the combination of fractalic geometries. Starting from a digital simulation, he "freezes" the tracks of a random moment of time, originating the volumetric idea on which house project is superimposed. It doesn't matter anymore, to him, the hierarchy between the idea of the space and the creation of the same: he superimposes them. The "virtual" is based on the infinite possibilities of shape and space. Unique and unrepeatable solutions and configurations are the result of the arbitrariness of the choice.

Libeskind draws 365 concentric circles, the days of the year, which rotate

UVODNIK
EDITORIAL
ČLANEK
ARTICLE
RAZPRAVA
DISCUSSION
RECENZIJA
REVIEW
PROJEKT
PROJECT
DELAVNICA
WORKSHOP
NATEČAJ
COMPETITION
PREDSTAVITEV
PRESENTATION
DIPLOMA
MASTER THESIS

around the axis of an "empty" centre that represents the architecture. His "virtual infinity" has no scale.

These four projects have something in common: the "space-time" research, the concept of chance, the mutability of the space, the instability, and they prefigure the future contemporaneity. The project is the tool used to represent, communicate and realize our idea (using common conventions).

But it is, of course, more than that: it's the representation of the world vision of the architect, it's the synthesis of many questions, and it's a possible solution to a complex problem. One of the possible solutions, the one that, in the architect's point of view, better satisfies the many requisitions. And it's, above all, a moment of synthesis. The project is the Idea. It's the solution that joins all architect's knowledge, his experiences, his history and his feelings; and, maybe, his own architectonic "theory" as well. It's the solution that joins all architect's knowledge, his experiences, his history and his feelings; and, maybe, his own architectonic "theory" as well. The abstract reflexion represents that complex and deep entanglement that connects technical, artistic and critic activity of every architect (not always all together) to his vision of the world.

In every period critic, project and theory interact with each other, as they implicate themselves in the perspectives that characterize the great movements of thought of a particular historical period: these paradigms are useful to guide the scientific research and every type of research, even that project-theoretical in architecture.

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LINES

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IZVLEČEK

Dojemanje elementov nekega sistema pogosto vodi v njihovo soodvisnost, vzajemno pogojenost in zaviranje. Linije osnovnega geometričnega elementa so postale model redukcijskega sveta, ki temelji na osamitvi v skladu z določenimi merili, kot so funkcija, struktura in družbena organizacija. Njihove sledi v sodobnem svetu občutimo kot fragmente ali ruševine sistema prevladujočega položaja neke predpostavljene hierarhične enotnosti. Kako se rešiti take odvisnosti ali determinizma? Kako naj linije postanejo manj »sistematične« in bolj avtonomne ter oblike manj redukcijske in bolj odprte? Kaj na temelju nove, kontroverzne podlage narediti z obliko, ki izhaja iz modernističnega determinizma? Kako naj ti elementi ali oblike predstavitve v današnjem kompleksnem svetu postanejo oblika dejanj? V članku predstavljamo pomen linije prek zamisli Le Corbusierja, Leonidova, Picassa in Hitchcocka. Prostorske raziskave so bile izvedene na podlagi več primerov – projektov arhitekturnega studia »Residential Transformations«, ki so predstavljali ogrodje za določitev možnosti, od igrivih do natančnih, kot taktika preoblikovanja v različnih kontekstih sodobnega sveta.

KLJUČNE BESEDE

linija, taktika, preoblikovanje, sistem, fragment

ABSTRACT

The perception of elements in a system often creates their interdependence, interconditionality, and suppression. The lines from a basic geometrical element have become the model of a reductive world based on isolation according to certain criteria such as function, structure, and social organization. Their traces are experienced in the contemporary world as fragments or ruins of a system of domination of an assumed hierarchical unity. How can one release oneself from such dependence or determinism? How can the lines become less "systematic" and forms more autonomous, and less reductive? How is a form released from modernistic determinism on the new controversial ground? How can these elements or forms of representation become forms of action in the present complex world? In this paper, the meaning of lines through the ideas of Le Corbusier, Leonidov, Picasso, and Hitchcock is presented. Spatial research was made through a series of examples arising from the projects of the architectural studio "Residential Transformations", which was a backbone for mapping the possibilities ranging from playfulness to exactness, as tactics of transformation in the different contexts of the contemporary world.

KEY-WORDS

line, tactic, transformation, system, fragment

1. INTRODUCTION

We live in an interconnected world, related in different ways, at different levels, in a continuous space of flows. The everyday flow of information confirms this, our networking in different domains of affiliation witnesses this, our understanding of the complexity and nonlinearity of the world supports this. Still, under the conditions of an increasing number of migrants moving from east to west, from Asia to Europe, from the crisis-stricken to stable parts of the world, there is movement along certain corridors through which they penetrate into Europe. They use certain geographic lines of connection that provide the greatest economy of motion. In a similar way, when certain countries want to put an obstacle to such a motion, they use lines of separation, barriers, walls, boundaries. So, in a dramatic way, we are back to the main geometrical characteristics and schemes of organization of space. Hence, in the metastable contemporary world, things with their historic occurrences are neither surpassed nor do their boundaries disappear, but they occur in different ways in the new reality. How can lines be recognized as the main organizational form and used in the architectural projects of today? Drawing from several examples, various interpretations of the line in different contexts, i.e. urban, suburban, and natural, will be shown.

It is exactly this unequal development, the unequal distribution of goods and resources, which is the source of geopolitical polarization, militarization, and uncontrolled motion of people. What should have been overcome a long time ago, becomes the basis of our world. The promised way out of poverty and poverty reduction from freer trade, open markets, and neo-liberal strategies of globalization did not come true in the way in which they were promoted. Environmental degradation and social dislocations are unevenly distributed. The simultaneously uneven geographical development caused opposing motions of neo-liberalism with a number of possibilities and barriers in looking for alternatives (Harvey, 2006).

However, the ambiguity of the contemporary world, its indeterminacy in respect to an intensive complex system and a conflicting system, remained a dominant feeling of the contemporary world. Already from the debate of Modernity and Post-modernity in the 1980s, certain assumptions are derived about our present situation. The Post-modernity viewpoint tried to articulate the world at the beginning of an epoch, whose contours were still unclear, blurred, ambiguous, resulting in the end of a historic project – the modernization project (Wellmer, 1987). Still, the post-modern situation with the controversial ways of thinking, provided equivocal views, as in a hide-and-seek (rebus), from which the contours of a radicalized modernity as a post-radicalized mind can also be disclosed. Like in a rebus, in the post-modern thinking, one can distinguish the end of both Modernity and a radicalized Modernity. How can architecture be understood in terms of such an ambiguity – as fragments of a system or as a new radicalized superior system?

Hence, what follows below is not based on systematic research of a defined subject, but rather the paper touches upon different perspectives of a single phenomenon that occurs in certain relations and controversies.

2. LINES[1] OF DOMINATION

Architecture as part of the modern movement accepted the consequence stage of production. The practices of Taylorism and Fordism were proposed as models for the regeneration of architecture and society (Hill, 2003; McLeod, 1983). Architecture should be seen as a step to dissolving the existing needs of people at different levels and their massive application. To that effect, the line of connection, or the line of production in both conceptual and concrete senses, i.e. as a line of machines and factory workers, with a product that moves along while it is being built or produced, became the main organizational model of space. The use of an assembly line reduced the assembly time of cars from 12 hours to 93 minutes. The increase in assembly speed meant faster availability, giving impetus to the American car culture as well as the increase of the society's mobility (example: the assembly line at the Ford Motor Co.'s Highland Park, Mich., plant in 1913; Perkins, 2012).

The line as a continuous action is an expression of the modern paradigm, both of production and the social and spatial organization. The spatial approximation of the production models is presented here with several anthological examples, namely architecture as an infrastructure in Le Corbusier's proposals for a city-viaduct (1930), and the architecture as a line of displacements through the linear city of Magnitogorsk of Ivan Leonidov. They showed the idea of the line in the most suggestive way, as a pluralistic infrastructure, as a dialogue between architecture and theory, as a programmatic layering of parallel bands.

In the 1930s, the ideas about the linear form of the city as extreme scenarios in respect to its structure and position were developed. Le Corbusier proposed a model of the city arising from the logics of traffic infrastructure, a city-viaduct, in two challenging locations, namely Rio de Janeiro (1929) and Algiers (1930–33) (Frampton, 1985/1980, Frampton, 2001). In the drawings of the city-viaduct, we see a wavy line that penetrates into the landscape, or is layered and juxtaposed in relation to it. The theme of the linear form is derived through the direct relationship between architecture and the territory. The territory, i.e. the environment, is not only a background, nor a system in which architecture dissolves, but the material of architecture that it modifies or governs. Their sensual play, the play of the line and the ground, evokes the erotized lines of Le Corbusier's drawings of female figures from this period (Le Corbusier, female nude, Algiers, 1931; McLeod, 1988, p. 500).

For Leonidov, the linear form in the project for the socialistic settlement at the Magnitogorsk chemical and metallurgical combine (perspective of lines of displacement, the middle band of a linear city) is a tool for spatial and social reorganization: "*first, a new social concept, and second, its translation into architecture*" (Leonidov, 1930, in: Frampton, Kolbowska, 1981, p. 68).

Through the theme of the linear form, Leonidov decomposed the city into a number of sectors, parallel bands, for housing, sport/recreation,

1 A line is length without breadth (Pickering, 2010/1847). Their character depends on the interpretation of this geometrical characteristic. Lines are symbolic and concrete organizational forms of the new modern times. In several key positions, we shall consider the genesis and the modes of their interpretation.

transport of passengers and goods, as a concept that allowed a practically unrestricted linear growth (Figure 4). The linear programmatic layering of a territory had to enable a dynamic coexistence of different activities and their interference in a complex entirety. In that way, the linear distribution was seen as a form of unfolding of the old weathered city and repositioning in a new complete habitat in which, work, leisure and culture are interconnected organically (Leonidov, 1930).

In the "Bull" series of 1946, Picasso demonstrated how the entirety of presenting the bull is reduced to a continuous linear gesture. Through 12 lithographs of one and the same object of presentation, he shows the development of a piece of art from the academic to the abstract level. In the series of presentations, Picasso sets apart the image of the bull to disclose its essential presence through progressive analysis of its form. Each sheet is a successive level of research toward expressing the spirit of the presentation by reducing the drawing. In the final presentation, Picasso reduces the bull to a simple contour. However, while the line resulting from progressive reduction that shows the essence of the presentation fascinates and captivates us, the entirety of the body with all the brutalities and attractions of animal energy is lost and missing.

What is happening with the line in the postmodern or radically modern period? The line is no longer a paradigm of the production/technical model. This is a rhizomatic model of intensive complexity – a multiple. The line seems to have been surpassed, and becomes an expression of abandonment and emptiness, or a theme of patchworking different informal fragments – the "remains" of the modern society. But still, this architecture is a phenomenon of the boundaries, and it takes place at the boundaries. The linear elements are indeed fragmented, disrupted, but it is exactly their transgression that gives them an additional unexpected possibility. Their release from the programmatic determinism leads to their substantive possibility.

The architectonic history of Skopje shows a dramatic reversal of lines as a compositional strategy of organization of the city. The modernization of the city started by introducing linear formations that initially only touched each other or were fragmentarily superimposed, but later, in the period of post-war reconstruction, the city itself obtained a linear projection. The formerly radiocentric city of the first half of the 20th century transformed into a linear city of the second half of the 20th century (Bakalchev, 2004). However, such an orientation not only predetermined its form but also limited it and disabled it in the total entirety of the city. The linear organization essentially resulted in fragmentation and reduction of a number of everyday and idiosyncratic positions of the city. Its many-facetedness became an expression of fragmentary autarchic presence of the lost or absent unity. The desolated appearance of the railway station platform (Figure 1) in one of the main megastructural segments of the post-earthquake reconstruction of Skopje points to the perception and material conditions of the former unitary project on transformation and integration of the city and the region (Transportation Center, the view of the tracks from Skopje's Main Railway Station, concept by Kenzo Tange).

Figure 1: Transportation Center, the view of the tracks from Skopje's Main Railway Station, concept Kenzo Tange. Photo: Lorenz Bürgi (archiv: Bakalchev, M.).

How are lines understood in architecture today? Undoubtedly, they have powerful organizational features, but also an unpredictable character in their development. They can be repeatable, predictable but, at the same time, they possess an uncertainty, a wandering curiosity in motion.

3. LINES OF INTEGRATION / ACTIVE LINES

In a number of projects of the Integrative Studio at the Ss. Cyril and Methodius University in Skopje, using the linear distribution, we wanted to surpass its association with the system of totalitarian organization and strategy of planning and use it as a direct tactic of urban transformation – to return it to the real needs for surprise and utilization. In the research carried out through the project, the referent approaches and methods of transformation were referred to as tactics, unlike strategies meaning complete systemic and hierarchical approaches to the city. Tactics are approaches that arise from the local situation (Tasic, 2015).

We refer to both the specific form of the existing urban fragments and the idea of the collective form from the 1960s (Maki, 1964) as a model of transformation. Conceiving the concept of the mega form from the 1960s, as a formal system that re-examines the hierarchical system of the city, a potential was seen in the transfer of its fundamental principles to the local level, i.e. to the level of urban fragments and residential pockets. The mega forms offer an alternative approach to the modern urban phenomena, as a mechanism that has a potential to yield unexpected results in the local contexts at different levels of intensity of transformations. Starting from the idea of the collective form, through a series of hypothetical scenarios, different tactics of transformation of the residential texture were developed in the selected locations in Skopje and Veles.

3.1 Case one: Inversion Lines, location: Novo Maalo, Skopje

The dramatic waves of modernization caused fragmentation and disappearance of the formerly existing traditional ground of the city. However, fragments of the traditional city still exist. Although their physical structure

undergoes processes of transition/destruction, the templates of the street plans remain as records on the surface of the city.

From the typomorphological viewpoint, street plans are defined as primary elements because they participate in the evolution of the city over time in a permanent manner, and because they are recognized as the main constituent element. But what will happen if these primary elements experience a turnabout? And if the void street plans become solid, while the existing residential texture is gradually emptied? The research conducted by several projects was focused on the effects of that procedure, the transition of the void into solid, the creation of a new urban artefact out of the deep structure of the existing one. Through the inversion of the street plans from void ones into solid ones, a new configuration is obtained, as an upgrade of the street system into a new collective mega form. In that way, the linear structures are the base for settlement and also connection with the referent positions of the city. Thus, through decomposition, selection, and extension of selected street plans, a new local installation of the city can be obtained (Figure 2).

Upgrading refers to the placement of residential bridges over the existing residential texture. The position of the bridges arises from the main street plans of the Novo Maalo neighbourhood. These are placed beside three streets that intersect. The two street directions are of the same height and are the basis for housing, while the third is placed the highest and connects the neighbourhood with the Vardar River. In this way, through decomposition, selection, and extension of the existing street plans, a new city installation is obtained as an inverse reconstruction of the urban fragment (Figure 2).

3.2 Case two: Incision/Cutting the City, location: East–West Industrial Zone, Skopje

The post-war reconstruction of the Skopje city saw the city as a linear system. The previous radial models exploded into a linear set-up, with a new spatial syntax and new functional criteria of segregation. The linear segment on the Vardar's right banks developed as parallel zones for industry, housing/education, and parks. However, while different programmatic bands were juxtaposing in longitudinal direction, they were increasingly becoming a barrier for the transverse directions of connection. Through the incision/cutting procedure, a linear configuration was established in

Figure 2: Prototype of partial upgrading of the streets and their connection with the surrounding referent positions of the city, Gordan Petrov, master project, 2013.

Figure 3: Incision, tactics of assembling the urban fragments, Aleksandar Petanovski, master project 2013.

the transverse direction of the former longitudinal city, in its east sector, thus connecting the different programmatic and morphologically isolated fragmentary zones that exist today. Today, the line cuts the fragmentary autarchic industrial band, the informal residential pockets and, through them, connects the education zone on the left bank and the residential settlement from the 1980s on the right bank of the Vardar river.

The procedure of incision (cutting) of the city and the superimposing linear formation enable spatial and programmatic upgrading, simultaneously connecting different positions of the city. The incision is a linear sequence, not as a system but as another fragment that reinterprets the existing fragments (Figure 3).

3.3 Case three: Southeast–Northeast, location: southeast–northeast axis, informal commercial and production zone, Skopje

One of the longest and, at the same time, the most unknown axes of the Skopje city is the southeast–northwest axis whose traces can be followed in the northwest part of the city, in different, but successive spatial segments. The southeast–northeast direction is one of the main directions of connecting the Skopje city with the former Adriatic roadway, and was never articulated in the architectonic plan of the city. The development of the city followed two axes: the north–south historic evolution of the city from the left to the right bank of the Vardar river, and the east–west direction, i.e. the linear extension of the city in the second half of the 20th century. In such a development scheme, the diagonal was not involved. But, it is exactly this direction that in the period of post-socialistic transition accumulated different fragments of production and commercial character, a kind of an informal production/commercial band merged with rural and natural landscapes. In what way could this zone be integrated into the city without losing its indefiniteness and without entering the urban planning system? Can one juxtapose the architecture directly upon the territory? A number of projects of the Integrative Studio 2013 dealt with the theme of architecture – the territory as possible architectonic constructions. Through a number of tactics of displacement, the research was directed at the spatial and programmatic possibilities of this city axis. The objective was to investigate the historic and spatial origin and to propose new modes, models, typologies, and places of settlement along the southeast–northwest axis as its spatial, programmatic and semantic recolonization and reintegration into the city. In the Linear Suspending City project, in a linear formation of 7 km, the

Figure 4: Linear suspending city, Viktorija Bogdanova, Dragica Spasevska, Integrative Studio 2014.

residential segments suspend in clusters upside down, from the 11th storey platform to the base, and free the terrain in the existing continuity, creating a city between the earth and the sky (Figure 4).

3.4 Case four: Symbiosis Line, location: Serava river channel, Skopje

The historic orientation of the development of the Skopje city along the two main axes, namely the north–south one normal to the Vardar river and the east–west one parallel to the Vardar river, created an artificial attitude toward the morphology of the city and its inner connection as well as toward the topography of the terrain itself. Despite the strategies for connection in the different scenarios of modernization of the city, the left and the right banks remained separated. It is exactly the finding out of everyday possibilities for their connection, artificial and natural, that should increase the complexity of the city. Therefore, the left tributary of the Vardar river, the Serava river channel that penetrates into the margins of the city, can become a line of symbiosis of the surrounding residential, industrial, commercial, and archaeological fragments. What is common to the heterogeneous fragments on the left bank, as opposed to the city park, is their non-consolidation and non-connection. The rural, agricultural, production, and archaeological fragments have another more common potential – the Serava river channel with the prospect of becoming a promenade that connects and is settled with interpolated scaffolds/platforms for temporary settlement, and as a city public transport line, which will provide a new branch of connection on the left bank behind the Skopje fortress and a new place for meeting and connecting citizens. In that way, the channel line in a length of 4.35 km can become a tactic for transforming marginal zones of the left bank of the city (Figure 5).

Figure 5: Symbiosis line, Bisera Irakovska, master project 2013.

3.5 Case five: Extreme Housing Lines, Inner Margins of the City, location: littoral zone, Veles

The Veles city is one of the prototypes of Macedonian cities, with clusters built on an exciting topography along a wavy line of a river. The extreme conditions created an intensive and spectacular form of a settlement, an amphitheatre composed of individual houses and courtyards. But, it is exactly this set-up that caused difficulties and controversies in the process of modernization. The layering of the infrastructure roughly separates the city from the Vardar river. The international Skopje–Thessaloniki railway line and the regional road sections were the first to cut and displace the urban texture. The Vardar river that was once a line of unity became a zone of fragmentary touches of the former city. However, can the city once again be connected with the river again? What if a new margin between the city and the river is constructed in a way in which the infrastructure in the modernization period was superimposed, separating them? Through the extreme housing project, the researchers explored the possibility of a continuous line (d = 900 m x L ~ segment of the central area) as a form of settlement, programming and shaping in-between the city and the river, as a joint intersection of fragments of different systems (Figure 6).

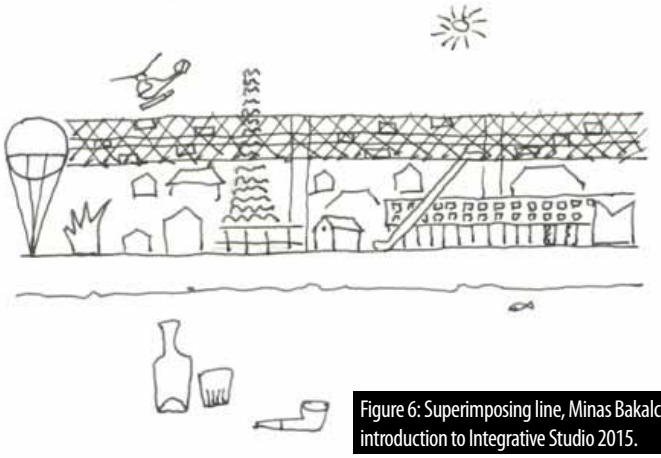

Figure 6: Superimposing line, Minas Bakalchev, introduction to Integrative Studio 2015.

4. SPELLBOUND

There is something odd with Edwards, the figure in Alfred Hitchcock film (lines on the tablecloth with a fork, footage from the film), *Spellbound* (1945). He exhibits a hostile reaction when a young psychoanalyst Peterson draws lines with a fork on the tablecloth and is almost out of his mind when he notices something odd in the line patterns on her dress (Figure 12). Peterson begins to doubt that he is not the real doctor Edwards. She examines him and concludes that he is a delusional amnesiac and that the real Edwards is missing. The main figure has a phobia of lines on a white background. An incident caused his amnesia and a general guilt complex. The lines are connected with tragic events – the murder of his friend during skiing and his brother's accident in his childhood. These two incidents are associated with a linear structure and disturb him by evoking memories that make him feel guilty so he tries to suppress them.

People face a world of fragments from different modernization layers that disturb them, and thus they suppress their memories about them. However, they are still present. Their historic failure in reorganizing the society and the total environment blurs their contours. We associate our failure not with the mode of behaviour, but with the subject of action. If the line structure does not yield a result, it is because it is limited or reduced and should obligatorily be extended in a system, in a network, in the total natural and created world that we fill with the same obsession and totalitarianism. But, is this the right way? Is our mode of seeing things, our method, burdening our actions as well?

In the paper, a chronological and epistemological classification of the line was discussed. The lines of domination were connected with the lines or the linear form that is used as an expression, a representation of a system that has the ambition to establish, in an integral way, a model of transforming the different levels of the environment/the society. Unlike these, the lines of integration as active lines are those linear forms that do not arise out of pre-determined models of behaviour or planning, but are an expression of local interactions and procedures of action, juxtaposition, or superimposing. Thus, the former can be associated with a reductive form, i.e. representation of certain isolated criteria through which the entirety is transformed, while the latter could be associated with a certain operative form, or a certain autonomy of form whose activity can lead to new and open meanings of the element and the context.

5. CONCLUSION

In the study, an overview of the meaning of the "line" was made as a possible model to re-connect the fragments of different systems in a new spatial order, which has today gone from the "physical" perception of the line to the "psychological" meaning in spatial order/disorder – the rejection of the totalitarian, the abstention from the systematic and the acceptance of the everyday as a playful characteristic of the things that lead to new knowledge. The line as an inversion of the urban area, the line as an incision, the line as following natural and created traces, the line as a mutual relationship between layers of infrastructure and texture, the line as a diagonal view, leads us through the new picturesqueness of the ambiguity of the post-modern/radically modern world. If, under the pressure of global geopolitical occurrences, we are increasingly not able to talk about deterministic models, in the disruptions and voids, we could certainly see the structures of the realistic world in a new way.

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THEORY BY DESIGN SYSTEMS

Olga Ioannou: SINERGIJE ARHITEKTURNEGA IZOBRAŽEVANJA PREK SPLETA IN V UČILNICI – PREOBLIKOVANJE PROGRAMA IN UČENCA

ARCHITECTURAL EDUCATION ONLINE AND IN-CLASS SYNERGIES: RESHAPING THE COURSE AND THE LEARNER

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IZVLEČEK

Tradicionalno se arhitekturni programi načrtujejo v kontekstu fizične učilnice, kjer je neomajni pogoj za učenje neposredni odnos med učenci in učiteljem. Toda ta model učenja je nastal v času, ko tehnologija še ni vplivala na učenje. V arhitekturno prakso so digitalni mediji že prodrli, v arhitekturno izobraževanje pa še ne. Avtorica navaja, da vključevanje spletnih izobraževalnih praks v arhitekturne učne načrte koristno vpliva na izobraževanje na področju oblikovanja, saj veča medsebojno sodelovanje in zagotavlja, da študentje prevzemajo odgovornost za učenje. Za ponazoritev koristi sinergije arhitekturnega izobraževanja prek spleta in v učilnici smo pripravili mešani program na podiplomskem študiju nacionalne tehnične univerze atenske šole za arhitekturo. Skrbno smo preučili sodobne trende spletnega učenja v zvezi z njihovo združljivostjo s kulturo arhitekturnega oblikovanja v smislu »učenja skozi prakso«. Program je bil pripravljen v skladu s temeljnimi načeli konektivističnega modela, kjer je učenje povezano z zmožnostjo oblikovati omrežja povezav in se po njih pomikati (Downes, 2012). Ta pristop smo uporabili zaradi podobnosti s prakso oblikovanja, kjer morajo študentje iskati kritične povezave za ugotavljanje prostorskih pojavov in rekonstrukcijo realnosti. Vsebina programa je bila preoblikovana tako, da ustreza novemu mediju. Študentje so imeli na voljo več poti za komuniciranje. K vsebini so lahko tudi sami prispevali. Analiza podatkov je pokazala, da raven sodelovanja, izmenjava in zadovoljstvo študentov še nikoli niso bili tako visoki, kar so pokazale tudi ankete, ki so bile izvedene po koncu izvajanja programa.

KLJUČNE BESEDE

arhitekturni seminar, mešani programi, teorija konektivističnega modela, spletna orodja za učenje

ABSTRACT

Architectural courses have been traditionally planned in the context of a physical classroom where the direct rapport of the students with the instructor is an unswerving condition for learning. This model was formed, however, at a time when learning was not impacted by technology. Although digital media have infiltrated architectural practice, they still elude architectural design education. The author argues that the integration of online educational practices in architectural curricula can benefit design education immensely by raising interaction and making students assume responsibility for their learning. To demonstrate the gains of online and in-class synergy in architectural education a blended course was set up at the postgraduate program of the National Technical University of Athens, School of Architecture. Current trends of online learning were carefully examined in regard to their compatibility with the architectural design culture of "learning by doing". The course was eventually founded on the core principles of the connectivist model where learning consists of the ability to construct and traverse networks of connections (Downes, 2012). This approach was chosen because of its affinity to the design praxis where similarly students are required to make critical connections in order to map spatial phenomena and reconstruct the real. Course content was redesigned to comply with its new medium. Students were offered multiple channels of communication. They were also asked to contribute to the content material. Course data analysis demonstrated an unprecedented level of participation, exchange and student satisfaction as expressed in the surveys that followed the course's completion.

KEY-WORDS

architectural design studio, blended courses, connectivist theory, online learning tools, student interaction

1. INTRODUCTION - THEORETICAL FRAMEWORK

Contemporary approaches in higher education often involve the integration of online tools. From Open Distant Learning (ODL) to Massive Open Online Courses (MOOCs) there has been an outbreak of new technology used to overcome the temporal and spatial vehicles of distant learning (Hollands & Tirthali, 2014; Barber, Donnely, Rizvi, 2013; Daniel, 2012, Comier & Siemens, 2010). Tools used for e-learning practices are also currently being tried in more flexible blended learning environments where the in-class sessions are supported by online features (Griffiths, 2013; Norton, 2013). The level of collaboration between the two mediums varies according to the objectives of each course.

In architectural curricula the incorporation of online tools of learning has been scarce so far (Bender, 2005). In most cases, the online presence of an architectural course simply reflects its in-class development (flipped classroom mode). The design studio in particular, the backbone of architectural education, is deeply rooted in the physical co-presence and interaction of professors and students and that is a habit that has resisted change. So far some isolated examples have been registered such as Susan Yee's MIT successful attempts coordination to form interdisciplinary and transcontinental synergies between architectural Institutions. Technology was used to support the social character of learning by bringing together people from different cultures. (Yee, 2001) Or the more recent venture of Petar Arsic's Design Studio at the Faculty of Architecture of Belgrade University. Here, the course's online aspect was mostly oriented to supporting the studio as it is, by incorporating MOODLE features and profiting from its repository character (Devetakovic et al. 2011).

During the research, one theory in particular stood out because of its resemblance to the general framework of the predominant architectural pedagogy: the connectivist theory. In this model of self directed learning the major activities involve: aggregation, relation, creation and sharing (Kop, 2011). Likewise, the students of architecture are expected to collect information and reflect upon this material in order to eventually create something of their own. The outcomes of this mental or cognitive process are consecutively shared between classmates and often discussed openly between the network of professors and students (Salama, 2015). This is an affinity that was worth looking into. The course redesign was founded on the connectivist model of education.

This paper examines the process of the course redesign and assesses the outcomes of its implementation. It starts by describing the objectives that led to the decision of using online tolls of learning. Then it follows the changes made to the course's components: its content, its layout, the additional features that were used and its new deliverables. It continues by presenting student ratings and their evaluation of the redesigned format. In the final section, the author assesses student performance in regard to the course reform.

2. THE EXISTING COURSE - COURSE REDESIGN OBJECTIVES

The original course of "New Fields of Design and Construction"[1] had been formed by joining two distinct yet complementary units of content. The first part of the course examined Urban Homoeostatic Clusters (UHC). It presented students with a series of city mapping techniques and then illustrated ways of managing the data retrieved to shape integral strategies for urban interventions. Course content was based on a wide range of the most recent PhD dissertations and undergoing postgraduate research which dealt with ways of reading the city phenomena. The second part of the course had been based on the Urban Ecosystems of Innovation (UEI) and in particular the collection and management of urban data with the aim of forming digital networks and helping make a city smarter.

The course was originally held only in-class. Each week a new mapping tool was presented during a three-hour session along with examples of its application. Interaction with the students, however, was problematic. At the end of each presentation, students were given little time to ask questions and comment on the subject discussed that day. It was only at the end of the semester that students were asked to actively engage by using one or more mapping tools to read a specific urban area in Athens. What is more, students worked alone for their projects. Grading depended mostly on the performance of the students on their individual assignments.

The redesign of the course was primarily conceived as a way of dealing with the course's intrinsic weaknesses. As in-class sessions were mostly devoted to presentations, students did not have enough time to familiarize themselves with the course content. They were often overwhelmed by the quantity of the information. Class discussions were short, awkward and rarely exhaustive. Course duration needed to be increased, preferably without shrinking the content.

Switching to an online environment for the transmission of content material offered a way out of this impasse. The task that was eventually undertaken, however, did not solely involve the accommodation of the content in a digital online environment. The course redesign sought to find a way to increase the interaction between the parties involved in the process. Its revised version aspired to create a learning environment as indicated by the connectivist model where "knowledge is not transferred from educator to learner and where learning does not take place in a single environment; instead, it is distributed across the Web, and people's engagement with it constitutes learning" (Kop, 2011b).

All this led to the creation of a hybrid course that called for an extended participation of all parties in multiple learning environments. In this new setting the focus lay on the students as a learning community. Students were no longer considered as simple receivers of information; they became active agents in the process of creating knowledge by assuming responsibility for their learning.

3.0 COURSE REDESIGN

3.1 Content

It was decided from the start that the course content would be uploaded online prior to each in-class meeting as a prerequisite for the students' in-

1 For more information: *https://www.arch.ntua.gr/en/node/1147* (official page of the course on the University's website)

-class presence. The first important step was to determine the course main subjects and then redesign their content in terms of online and in-class material (Hanna, 2012). It was decided that this pilot course would include the course content of the UHC only. Six content units were selected in that regard. (Fig. 01)

Conversion into online lecture material meant that a large part of the existing course content needed to be condensed and translated into various forms of online communication and resources such as video lectures, images, links to articles and software demonstrations (Fletcher and Bjerkass, 2012). Consequently, all participants of the teaching team engaged in an in-depth process of reconfiguring their material by adding more online resources. They also had to reduce the duration of their lectures[2] (Guo 2014; Siemens, 2012). A very important factor was also considered from the beginning: students would not necessarily view all weekly video lectures together or in sequence. Therefore, the viewing of the content material had to be planned both in the context of the videos of the same tool and independently.

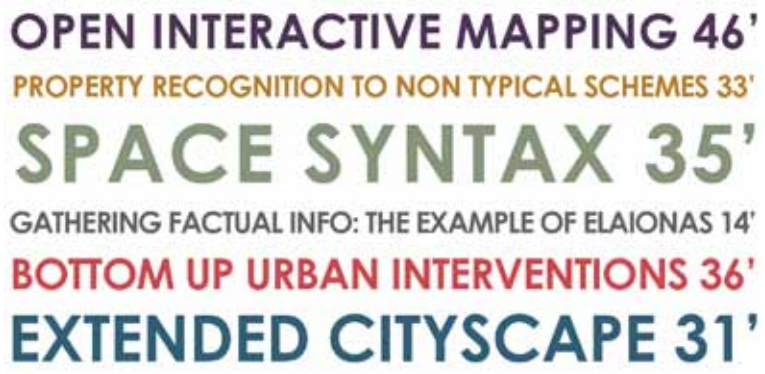

Figure 1: Content Units of mapping tools. Conversion of the former presentations into online content limited their duration.

The process of hammering the content material ensured short duration videos and a clear sequence in unit planning. The final order of the tools' presentation stemmed from a balanced succession of the units' level of difficulty. Additional administrative information was also configured at this point in the form of written instructions and introductive course material to help students navigate in the online environment.

So far the "atelier"[3] character of the connectivist MOOCs had begun to match the studio character of an Architectural Design Course. But "to learn in a connectivist course is to grow and develop, to form a network of connections in one's own self" (Downes, 2012). The need was not only to launch a ready-made environment of knowledge for dissemination, but to engage in a rich text-based, design-based and multi-media based interactive environment of practice. And there was also an immediate need to design the network within which this interaction could take place.

3.2 Layout

Students attending this postgraduate course come mostly from Architecture Faculties. But there are also a number of students admitted from relative disciplines like Fine Arts as well as students who have a second degree in Architecture and a first one from some other discipline, not always directly relevant to Architecture. As a result, the profile of the learners of the Postgraduate Course varies, along with their age, their professional life experiences and their individual competency.

Since students have different background knowledge, they do not share the same ability and skills to learn a subject. Students of the course would develop a personal learning path in the context of their former training (Kolb, 1981). But what if those paths were somehow open to all? What if the

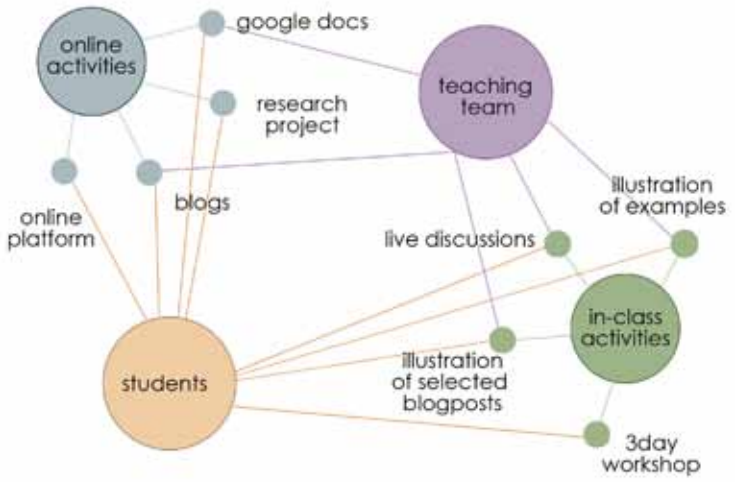

Figure 2: Course development layout. The figure illustrates the interaction between teaching team and students through the various channels of communication established for this course.

students could keep track of each other's work outside the classroom and - why not - cross paths with each other?

In this context, the connectivist act of encouraging the establishment of student blogs was decided as the best way to create a network between the students that would enable them to monitor each other's work. There would be no prerequisites for the blogs' maintenance and no one would be obliged to report at a certain pace. The blog would be their individual contribution to the course content and the grade of interference would be up to them to decide.

The course layout that prevailed included that the teaching team would transmit an initial stimulus -one mapping tool for every week of the course-

2 Duration of the videos did not exceed 6-7 minutes. A ten page script was used as a size guide to the recordings.

3 This characterization is used to describe the fluid nature of cMOOCs, less directive in respect of process where the instructor plays the role of the facilitator and learning outcomes are unique artifacts. (Hollands, Tirthali, 2014)

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online. Students would watch it and add relative material on their blogs, their thoughts on the matter, and perhaps an application of the tool they know of or something they were reminded of while thinking about it. Both parties would have to consult each other's online presence before attending the physical classroom4. In any case, the enacted course could hardly shrink the intended one. If the students failed to engage in the process and contribute with their own material, they could still consult an enriched version of original course both in-class and online. (Fig. 02)

3.3 Additional Features

Despite the intended lack of direct online interaction a provision was made, for a series of open-to-all online pages for common use. Two additional online features were strategically used to enhance the sense of sharing in matters of course administration and content management. This allowed all participants in the course to have a say in all aspects of this venture. (Fig. 03)

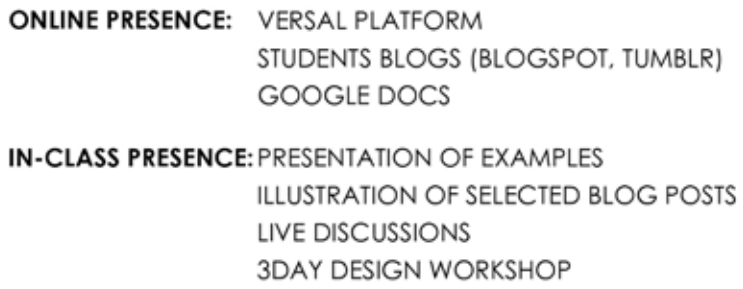

Figure 3: Online and in-class course features.

The first online feature has been the "Course Constitution" Google Doc as in the example of a practice adopted by Cathy Davidson in her "21st Century Literacies: Digital Knowledge, Digital Humanities" course, at Duke University (Davidson, 2013). The idea was to determine a mutually acceptable agreement on the terms of use of the online material from all parties involved and to help set the rules of online communication. Since this was a newly inaugurated type of collaboration depending on both parties, students and teachers should both be able to shape this class model and the conditions of co-existence. Just like in the Davidson case, the Mozilla Manifesto was adopted as an initial text on which the students and the teachers were invited to elaborate further.

The second online feature emerged from the complexity of the course content. Each mapping tool is described by a series of terms that define its inner structure and its properties. The words that are used to define those terms are mostly common but in the context of the tools they assume different meanings. Therefore, a type of lexicon was needed to facilitate communicating the terms' definitions to all students. But instead of introducing all those terms as definite entities of meaning, a second open to all Google Doc was set up under the title "Vocabulary of Terminology" to accommodate them. The students were invited to consult and reflect upon those terms' proposed definitions. They were also encouraged to contribute by modifying the definitions or by adding their own versions of what they thought each term represented exactly.

Course content was further enriched by the official report of a Research Program that was developed recently by the National Technical University of Athens that was financed by the city's Regional Administration. Its six hundred pages cover an extensive research of the city of Athens realized with the mapping tools that constituted the course content[5]. This material was handed over to the students at the end of the online presentations. The students were asked to browse through the report and start relating the tools to a realistic example of their direct application.

Furthermore, intermediate complementary material was prepared in the form of mini-presentations in between weeks to address issues that were brought up during class discussions. The flexibility of the course's configuration allowed the teaching team to intervene in case the students did not comprehend a particular aspect of the course content. This material besides being presented in-class was later uploaded on the platform as well to serve as a point of reference of the course's development.

The student blog posts also played an important role to the in-class material articulation. Every week, all posts from the student blogs were collected and evaluated by the teaching team for their relative importance to the course content. Taking into account the course's short life span, the teaching team made sure that the information of the students' research would be contextualized with the rest of the course's content. Some of these posts were consecutively presented in-class as they offered more insight into various issues raised.

3.4 Hosting platform

Recording lasted two days and the editing process lasted almost two weeks. During this time, the transcripts of each unit were deciphered. These texts were later used as the canvas for the editing process as well.[6] Images or snapshots of definitions were used to keep the rhythm of the presentation intact and highlight important parts of the narration. A series of graphics was also produced to signal the introduction and the conclusion of the units.

The internet platform selected to accommodate the course content was Versal[7]. After a trial period where a series of different platforms was tested,

4 It was firmly decided that the platform would not accommodate live discussions or forums and that exchange of views would only occur in-class and that this type of interaction would remain a structural part of the physical classroom.

5 The program and included the determination, the evaluation and the specification of a complex network of actions that would improve the conditions of urban life in selected areas of Athens, especially the city centre. It was held during the biennial 2012-2014. The whole program is available for download here: *https://www.arch.ntua.gr/node-resources/1147* (only in Greek).

6 Two providers' platforms have been used as prototypes: FutureLearn and Digital Leuphana. (*https://www.futurelearn.com* and *http://digital.leuphana.com*). Although they are xMOOC providers, they both aim at creating highly interactive environments for learning.

7 *https://versal.com/c/jxaqv1/summary*

Versal was chosen for its simplicity and the easiness of use both for the attending students and the contributing teachers. Most free online platforms have a rather commercial profile that did not suit the one of an academic classroom[8]. Therefore, while other systems available online guaranteed more insights and a considerable variety of analytics, the final decision was based on how the platform could fit in the requirements the team had set and not vice versa. (Fig. 04)

3.5 Deliverables

A design project was assigned to the students in a three-day workshop at the end of the tutorials. The students were encouraged to use one or more mapping tools of the course content to read an area indicated to them. The area selected for this semester was the highway overpass between Egaleo and Elaionas in the Western part of Athens. They were then asked to use this data to propose a strategy for intervention in the area. One of the course's outcomes was the representations, verbal and visual, of their endeavours.

The intention was to isolate the design workload of the program in a condensed creative and interactive experience. Therefore, the students shared their mapping outcomes in intermediate mini presentations throughout the workshop and their findings were openly discussed and analyzed by them all. At the end of the three-day session each student presented an autonomous personal approach to mapping and proposed a strategy of intervention that enhanced a certain aspect of the area they were able to map and evaluate. The results of the students' work were presented in full in-class on the last day of the course.

8 For more information on free platforms visit: Reviews of eLearning Platforms, Tools & Software for Teacher & Coaching, *http://bestelearningplatforms.com/software-tool-reviews*, Accessed 09 June, 2015.

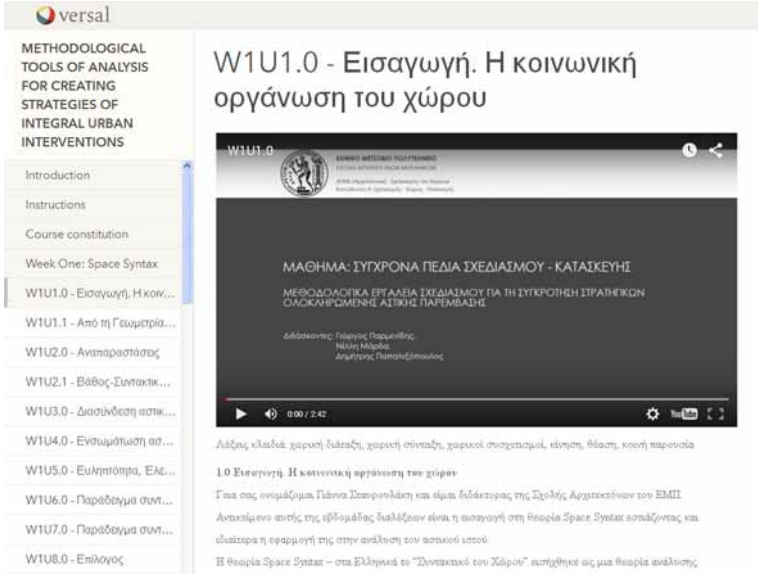

Figure4: Snapshot of the online Versal platform.

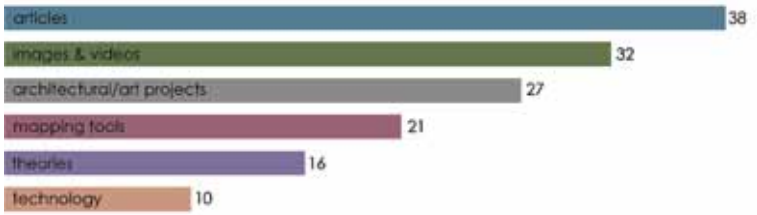

Figure 5: Types and quantity of student blog posts.

The students' constant blogging produced tacit manifestations for their engagement. From the 17 students who enrolled in the course 13 of them were active bloggers. A total number of 146 posts were accounted for within ten weeks' time with 38 articles, almost 30 architectural or art projects and more than 20 additional mapping tools the students had retrieved in their online research. The last month of the course's running, May, was also the most active one in terms of blog posts showing that in time this tool became an asset to the class. (Fig. 05)

The workshop design projects, the student blog posts and the students' registered visits to the online platform as these were registered by the platform's analytics compiled an integrated tool of summative assessments (Fletcher and Bjerkass, 2012). The teaching team and the supervising professors could therefore appraise students' performance and their degree of involvement during the course. Thus grading depended on these accurately measured components.

4.0 STUDENT RATINGS

The students were asked to fill in a questionnaire regarding the course. The four sections of the survey involved the evaluation of the online material, information about their online presence, the interaction between the different parties and their overall personal experience.

Video lectures were most highly ranked, gathering 6.57 out of 7 from the 14 students that responded to the final survey. So did most of the online features such the transcripts (6.29/7) the online articles (6.21/7) and the diagrams and charts (6.07/7). The lexicon was also highly ranked (5.57/7) despite the students' scarce interference. They consulted it but were reluctant to propose their own definitions. The Versal platform was also highly appreciated for its easiness of use (6.29/7) and the total duration of the video lectures (6.21/7). The six course content units were also appraised in regard to their appeal and their degree of difficulty. Space Syntax gathered an impressive 6.29/7 and 6.00/7 respectively.

Most of the students stated that they visited the platform at least twice each week and that the average stay for half of the them was from 30' to 60' while the rest stayed from 60' to 120'. Most of them watched the online lectures at home at their desk; most of them agree that the duration of the online lectures was sufficient.

In regard to the interactive aspects of the course, the students ranked the in-class discussions with a 5.93/7 and they also asked for the online inte-

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raction to become more intense. The contribution of both the teachers and the students was also evaluated (6.21/7 and 5.64/7 respectively).

In the last section of the survey students were asked to give feedback. Some of them asked for more software presentations and examples of the tools' applications. Some students stated the blog made them feel uncomfortable while most were enthusiastic about it and decided to keep it and continue to use it. Finally, students have rated their overall experience of the course (6.25/7).

5.0 COURSE REFORM ASSESSMENT

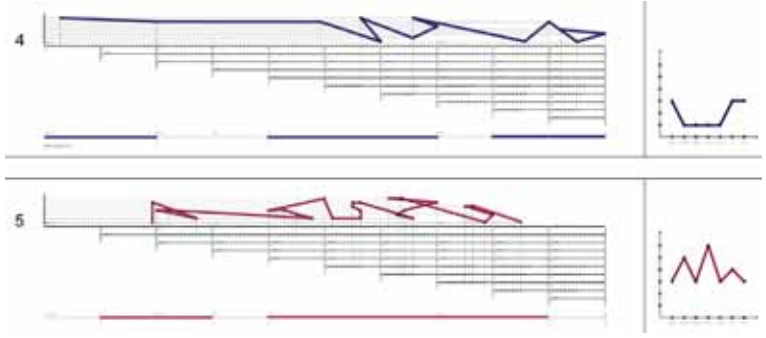
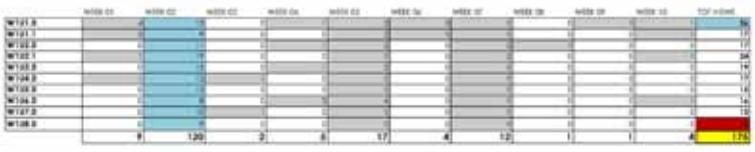


Figure 6: Individual User Activity Plots for the Online Material. On the left the colour line shows the student's overall attendance path. The chart on the right illustrates the students' daily attendance. The straight line at the bottom, illustrates their weekly attendance.

An important aspect of online learning resides in the possibility to quantify student attendance. The students' online visits were registered throughout the course through the platform analytics. The results reveal that students did in fact watch the material uploaded there before showing up in-class. That was a tangible result stating that the group supported this learning system. Students reciprocated the external stimuli they were given. The original intention to extend the temporal limits of the physical classroom has been successfully addressed.

Increases in the amount and kind of educational data offer researchers new opportunities to observe, analyze, and ultimately improve the learning process (DeBoer et al., 2014). The data gathered throughout the duration of the course allowed for the teaching team to monitor and assess student attendance habits. (Fig. 06)Their learning paths reveal their completely different approaches to learning. Some student charts show a linear progression. Most charts, however, are formed by crooked lines. This fact indicates that these students kept revisiting previous units despite the fact that the course had moved on. This asynchronous use of the online platform is one of the most successful aspects of the course redesign. Related charts illustrate the number of clicks on each chapter of each unit. (Table 01)

Table 1: Number of visits to each chapter of the first unit of the course. Colour blue signals the week of the unit's uploading. The grey cells indicate the times each unit was revisited at a later time.



Student projects were deeply influenced by the course reform. As it was described earlier, the conversion of the course content to online material made use of exchangeable units of meaning, both visual and verbal. The verbal units were mostly gathered in the Vocabulary of Terminology, a feature the students often consulted to navigate through each tool's presentation. In their projects they assimilated many of these terms to argue their own work. Some of the mapping tools presented in the course also made use of particular software. This was available on the online platform and students were given free access to these programs and their tutorials. Many of the students used this software in their endeavours to document their work. The visual representations of their projects were often founded on the diagrammatic structures produced by the software they used.

As it was previously mentioned, the course deliverables included not only the student projects' submissions but also their blog posts. This additional communication channel has helped the less active students to express themselves and share their views with the others. It also kept the in-class discussions running throughout the week until the next meeting as students uploaded more material related to the ongoing arguments. Besides registering the number or kind of blog posts another attempt was made to relate them to the course content. The blogs have proved beneficial in this regard by continuously linking individual student interests with the course content and with the rest of the class. The clouds of interaction vividly illustrate this constant exchange. (Fig. 07)

6.0 CONCLUSION

The switch from the passive receiver to the active participant creates the need to devise new behavioural patterns that will break the learners' inhibitions and help them renegotiate their role in learning. This course's reform was based on designing a mosaic of different settings to accommodate and nurture the active learner in the model of the connectivist theory of lear-

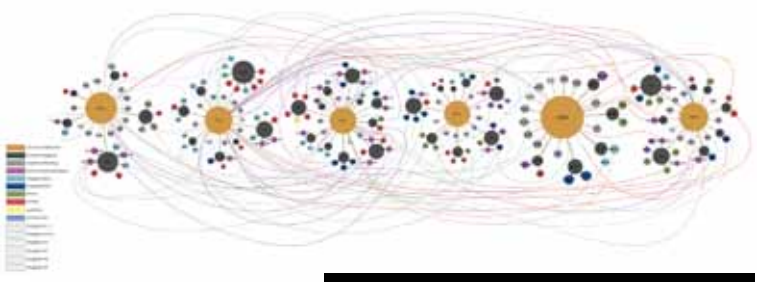


Figure 7: Student blog posts throughout the course and their interconnectivity with rest of the course content.

ning. The synergy of digitized online material and in-class live discussions promoted individuality and encouraged interaction.

The students' responsibilities were raised and so was the level of their interference with the course content in total. Their high reception and appraisal for this course is expressed in the high ranking that was depicted in the surveys following the course's completion. Student performance has also been improved and their attendance rates have doubled. The analytics provided by their monitoring showed -beside their extremely diverse learning paths- a consistent attendance rate throughout the duration of the course. Their contributions in the live discussions and their numerous contributions through their blog posts reveal their immense need to express themselves through more channels than the traditional ones.

This emergent type of learner matches the model set by architectural pedagogy according to which the designer is someone who seeks connections and relates collected bits of information to map and reconstruct the real. The self directed learner is in fact already the designer of his/her own learning path. Therefore, architectural courses and the design studio courses in particular, face a growing challenge of incorporating new technology.

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THEORY BY DESIGN SYSTEMS

Velimir Stojanović: VZROKI IN POSLEDICE CIKLUSA SPREMEMB V URBANI MORFOLOGIJI: Urbana teorija in praksa

CAUSES AND CONSEQUENCES OF THE CYCLE OF CHANGES IN URBAN MORPHOLOGY: URBAN THEORY AND PRACTICE

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IZVLEČEK

Ciklusi sprememb v urbani morfologiji imajo zgodovinsko razsežnost, ki je povezana s tistimi tokovi preteklih sprememb, ki s svojo močjo in učinki vplivajo na spremembe preteklih in sedanjih morfoloških pogojev, z mislimi na prihodnost. Tokovi preteklih trendov praviloma niso tesno povezani z urbano morfologijo, razen v redkih primerih. Dinamični učinki v prostoru pričajo o odtujitvi tokov in o vrsti njihovih notranjih dogodkov, ki se po navadi odvijajo ne glede na vzroke in posledice – so učinki zamisli, interesov in ciljev, ki delujejo na podlagi stanja urbane morfologije, tako njenih delov kot celote. Članek predstavlja ciklus vzrokov, razlogov, vplivov in posledic sprememb. Prostorske raziskave so obravnavale urbano morfologijo, strukturo in prisotnost reda/prostorskih pogojev v teoriji in praksi. Ciklusi sprememb, kot se kvantitativno in kvalitativno izražajo v prostoru in času, zato ne vsebujejo le algoritma dogodkov, saj se matematični, abstraktni izraz/abstraktna oblika ter objektivna in vizualna predstavitev te abstraktne oblike lahko izražajo in predstavljajo na veliko načinov.

KLJUČNE BESEDE

morfologija, ciklus, sprememba, vzrok, posledica, pravilo

ABSTRACT

The cycles of change in urban morphology have a historical dimension related to those flows of historical events which with its power and influence effect the change of both past and current morphological conditions, with the set of thoughts in the future. These flows of historical trends as a rule do not have a close relationship with the urban morphology, except in rare cases. The dynamic effects in space tells us about the alienation of flows and the nature of their internal events that usually do not care too much about the consequences and cause – effects points of their ideas, interests and goals, acting on the state of urban morphology, as in parts and in its entirety. This paper presents the cycle between causes , reasons, influences and consequences of changes. Spatial research was made through urban morphology, structure and the presence of order/ spatial conditions in the theory and its practise. The cycles of change, with their quantitative and qualitative expression in time and space, therefore do not have only the algorithm of events, as mathematical, abstract expression/shape and objective and visual presentation of this abstract shape can be expressed and displayed in many ways.

KEY-WORDS

morphology, cycle, change, cause, consequence, rule

1. INTRODUCTION

When change happens to urban structure, its occurrence is related to certain precise time – space frame. The change is caused by the action of those influences that can be observed, measured, recognized and which then turn into wider influences, acting on the surrounding structures and structural systems. The change has its beginning, its development period and its end. All changes with their beginning, development and end have their own causes, reasons and effects. It is the most logical and the most visible form of change. Behind that obvious form, there are much less visible and seemingly illogical flows of change of what exists and what is defined as an existing condition. The divisions of impacts are determined by their nature and type. Without that basic definition it is impossible to understand where change comes from, what consequences it brings and whether it is justified or not? The main characteristic of the urban structure is dynamism. The dynamism is conditionally taken as the static state and immutability. Change is, therefore, a phenomenon that eliminates this appearance and where the dynamics is necessarily confirmed as the basic nature of the structure, function, and the form of urban order. The impacts, causes, reasons and consequences which conditionally convert the static state into dynamism are present in every moment. There are no changes without causes, reasons, influences and consequences, regardless of whether they are known and understandable to us or not. How the causes, reasons and consequences of the changes, as well as the very change that happened, will be understood, is not just a question of causes, reasons and consequences of the changes, but also our ability to understand and realize them. As part of this relationship, known and unknown, comprehensible and incomprehensible, there are all other relationships that reflect the variability of urban reality, first through time and space dimension and then the other.

2. CAUSES OF CHANGES IN URBAN MORPHOLOGY

2.1 The nature and type of the change causes

The aim of the display of nature and type of change causes would be a scenic overview of the time-spatial flow change (transformation) without interruption and punctuated fragments. Any break in the development of urban structure is illusory. Urban structure develops continuously irrespective of how we treat its objective development. Urban legislation may, in different levels, attempt to control or prescribe the development but when, for whatever is the reason it does not do that, urban structure shall develop. Thus, the morphology of the city will be continuous variable category, whether we like it or not. It may be said that the lack of the law creates a law. All that is done in a city, sooner or later, or better said immediately, sets new laws of behaviour, conditions, development, trends, directions, growth dynamics, etc. These newly formed parameters may not be immediately visible, strong and influential, but will eventually come to the fore and thus lead to finding the answers to their presence. Nature and forms and mostly the structure of these laws remain largely hidden and unknown, and it is the biggest problem of architectural and urban analysis. That problem is moved from analytic to everything that has anything to do with urban analysis. Detection, presentation and definition of those laws are facing us with complicated formulas of relationships in quantitative value levels, which seemingly have no end. We can only give certain frames of observation and grouping of these relationships, which has been done up to now, but we cannot give the final form for the calculation of all the events in such a complicated set. Today's analysis capabilities supported by the most modern information technologies and techniques allow for deep penetration into an intricate world of real dynamic image development (transformation) of the city, but still not for a reliable formula of its behaviour.

The change in urban structure is natural, expected and inevitable process. It is defined in many ways depending on the fact what is sought for and found in the process of the change. Kropf (2001, p. 31) says: „The common point shared by these different kinds of change is the notion of a formative or transformative process. Allied to that notion is the explanatory strategy that we see now or at a given time is derived from what came before. To understand the end, or intermediate, result of a process – a building or town – one must examine and understand the process of formation." In many phases of the development of contemporary urban structure, the definitions and descriptions of the process were followed by chosen methodological approaches that were mostly connected to scientific and critical apparatuses of historical data, theoretical settings and logical methods of analysis, to the following of changes in a real structure, and by using contemporary methods of virtual modulation. The use of different methodological approaches has an important impact on the result itself and the outcome of the research. It is difficult to determine without deeper analysis of the economic, political and social spheres, as well as everything else that may occur as a factor of influence, which of these impacts is dominant. Speaking about the paradoxes of postmodern, Elin says (2002, p. 164): "The main feature of postmodern urbanism is contextualism (historical, physical, social and mass – cultural) which is exactly the opposite of termination of modern urbanism with the past and the spirit of the city. When adjusting to context was achieved in urban design, it was usually successful. In most cases, contextualism is not fully achieved due to political and economic constraints, remains from the past, failures of urban designers (who were just giving false statements about contextualism as they ran for their personal interests) and other reasons. In short, these objectives usually prove unattainable because of ironic errors of urban planners to recognize the broader context in which they build. When contextualism is not reached, the initiative of the urban project is usually not estimated (it is unsuccessful) except in certain cases where people themselves believe that the space is historically, physically or socially contextual (even if it is not) or do not care about it because space has success for other reasons, such as standard of living, which offers prestige and/or its location."

The basic approach to every change of physical structure of the city that is seen by many exclusively as a change of the form is in spatial - planned decision-making. This is best seen in the environments that are in the process of an intense economical development, but basically relates to the developed economical-urban environments as well. From this directive matrix, all other results related to the system, organization, function and at the end the morphology and form of the city arise. The morphology and the form

is a noticeable image of what is previously entered into them. Analyzing the development of urban structures in Brazil, Neto and Moreira (2002, p. 4-5) show the following organization of the procedure: „As stated in every master plan, a joint urban operation law must contain the following minimum elements: delimination in the intervention area; purpose of the urban operation; basic programs for area occupation and interventions; study on the impact in the neighborhood; economic and social programs directed towards population directly affected; counterparts to owners, permanent users and private investors; the way to control the operation, which must includes civil society representatives."

From this, we can conclude that the changes may, in the most essentialy possible way, be divided on:

- Unavoidable changes (which are a consequence of impacts, causes and reasons of the objective nature and the forces that cannot or may very little be affected by man, because they are outside the sphere of his power influence...,
- Changes that can be controlled by plans and other means and procedures, and which make up the largest part of the area of variable, no matter how we assess and evaluate them,
- Changes that do not need to happen, but that happen because particular interest factors present them in that way, typically as changes belonging to one of the above mentioned groups. That is a group of changes that are usually called the apparent or even false and that camouflage and conceal the real changes and their existence.

The complexity of the structure, levels, not only physical but also functional that lead to the form, require a deep approach of the analysis that is not related only for the architectonic urban sphere as a technical-technological category. Doevendans et al. (2014, p. 38) state the following about this: „These tendencies determined morphology and typology of the modern city. This will be shown from a theoretical and practical perspective. The presentation will focus on: I) how above mentioned assumptions led towards a design method of modularization, which had radical consequences for morphology and typology of the city. Modularization was applied on different scales, such as functional zoning at the scale of the city, formation of neighborhood units on district level and so called stamps at the level of allotments. The concept of the dwelling unit figured as a key word; II) examples of morphological modularization at the level of allotments taking the strip as point of departure, theoretically in the creation of stamps as morphological and social building blocks for the modern city, aiming at the creation of society."

2.2 The consequences of the causes of changes

Each change, whether justified or not, has something in its cause, reason and consequence which we might call the influence power centre or central starting point for change. After that, in accordance with the nature of the change, follows the development phase of change and the end of change flow and its impact. Full change flow from its starting point or source to its end represents is duration. It is relative and not always clearly defined and specific phenomenon, because the period of change duration relates first to the time in regard to the physical structure, function, and in the end form, while other indicators and meanings are either lost or not taken into account. The centres of power or influence (sources) of changes can neither emerge nor vanish without leaving their consequences, no matter what they are, somewhere in themselves, in their own time and space, to affect the creation of new centres of change. This means that it is not unlikely that any change that affects the creation of others, was itself created under the influence of some other change (changes).

It is understandable that we are interested in the character of such evolutionary cycle, apparently continuous, as well as in how it looks like and whether it includes (meets) all visible architectural and urban space in time or not? The first thing we can imagine is something like a linear stream of changes in space in time where one occurrence replaces another (figure 1). However, since neither the space nor the time or movement in them are exclusively linear and represent a multidimensional time – spatial continuity, the changes themselves are not linear but time – spatial. They do not happen by simple formula of the end of one and the start of the other change, but they are already multiple connected not only in the beginning and in the end, but in every possible time – space time. So every time – spatial moment of urban space (time) represents a potential change (its beginning, the end or, most often, the flow of influence) and whether it is really so we have to determine in the analytical procedure. Sources (centres) of influence, their flows and their end are not defined by a logical and easily calculable order which is always understandable and close to us. They are defined with no doubt, by complex laws of causes and consequences which must be presented in a way that suits us in order to be comprehensible. This imagery should not be a problem if we know the principles and the laws by which the changes take place and their basis in mathematics – systemic relations, in the form of the adoption of system constraints and urban legislation, the location information of urban statistics, in the form of visual and aesthetic experience of urban transformation, etc. Impacts and their complex interconnections are the most similar, technically speaking, to developments in the areas of dynamics (fluid dynamics), but they necessarily contain in themselves a number of sectors that characterize the profile of urban morphology.

This saturation of the impact of changes and their flows may be studied in the following sectors:

- Sector of general science of space and professional approach,
- Sector of the city morphology,
- Sector of area planning process,
- Sector of geostatistics,
- Sector of urban (political),
- Sector of urban sociology,
- Sector of urban philosophy,
- Sector of urban psychology,
- Sector of urban history, revitalization, protection and restoration,

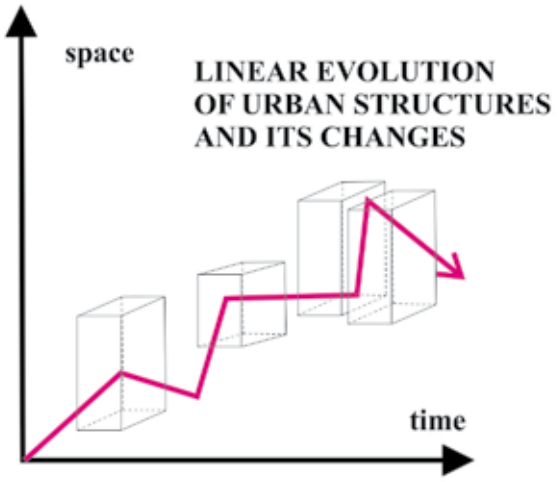

Figure 1: Linear evolution of urban structures and its changes (source: author).

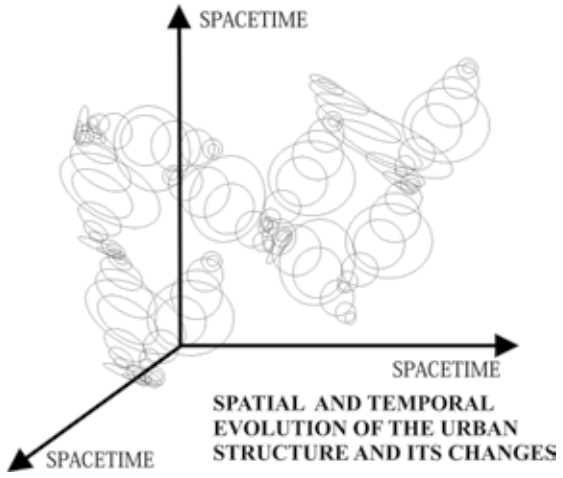

Figure 2: Spatial and temporal evolution of the urban structure and its changes (source: author).

- Sector of urban ecology,
- Sector of planning and design,
- Sector of technology and technological materialization (production) area, and
- Sector of general urban informatics and model simulations.

Layering, interactivity and permeation of the influences led to the conclusion that the form is the origination and the final result and not the abstract goal, cause and the reason for its own emergence. The introduction of multiple parameters that are by their nature different was explained by Lynch (1960, p. 9): "Since the emphasis here will be on the physical environment as the independent variable, this study will look for physical qualities which relate to the attributes of identity and structure in the mental image. This leads to the definition of what might be called imageability: that quality in a physical object which gives it a high probability of evoking a strong image in any given observer. It is that shape, color, or arrangement which facilitates the making of vividly identified powerfully structured, highly useful mental images of the environment. It might also be called legibility, or perhaps visibility in a heightened sense, where objects are not only able to be seen, but are presented sharply and intensely to the senses."

In such variable relationships there is no empty space and places where nothing happens and which are entirely exempt from the impact of changes (figure 2). Yet there is a fundamental division and it was reduced to:

- Urban areas of major events,
- Urban areas of peripheral events.

Peripheral zones, which are distant from direct ones and depend on indirect impacts of changes, but in which the changes leave traces, can be called zones of smaller or larger unintended uses, according to the nature of impacts and consequences.

Starting from the simplified displays of changes, we come to the question of what the centre of influence is, how it turns into a sphere/field of influence and how such centres and spheres of influence continue to establish their interrelationships and what their inner nature can be?

When a centre of influence appears, it begins to build around itself a sphere of influence which includes the existing field, and has a time component. Such a sphere of influence, together with its driving centre permeates (bumps into) other similar spheres in terms of its development activity and influence within is domain, giving a dynamic, flowing, interactive whole, seemingly unpredictable in its further behaviour. The dynamic interplay of influence is not the same in any moment, it is not only the form which is constantly changing and transforming, but its cause-effect essence. Emerging, expanding and exerting their influence, centres and spheres of influences weaken, and in those peripheral areas that we call peripheral areas of the event, they create new conditions that consequences can make the new centre of influence with its sphere! That is why the movement of the urban sphere, although measured, planned and orderly directed, is full of controversial movements and unpredictable events.

Relating to this kind of relation of the physical and psychological influence on the structure of a city Markus and Colding (2014, p. 9) deepen the whole range of inter-relations and say: "In spatial terms this again points to the fundamental role of our generic model of spatial connections and discrete spaces, where the more segregated spaces can work as pockets of memory for survival in crises and from which the system can be retrieved if the right connections are present. In extension, the specific configuration typical for a particular ecological or social system, or a combination of the two, can be reflected and manifested in the concrete configuration of the urban spatial system, which thereby can be said to carry memory and even knowledge about this particular system. In contrast, if such spatial support of the system is not allowed it will be more difficult to remember." With creating

different spatial configurations, urban design can be a memory of particular situation the system is designed for. "In a resilience framework we can come to a general conclusion, saying that a high degree of spatial redundancy, as defined above, promotes self-organization but decreases the degree of memory written into the system, while a low degree of redundancy works in the opposite way" (Markus and Colding, 2014). The vision of the city as a complex single change in the chosen time and space this way gains a necessary dimension of a contemporary multifunctional and multiformal change with an ecological dimension. Multifunctional and muliformal change is a new field of the work of the architects and urbanists and at the same time the field of the creation of new tools, methods and procedures of architectonic and urban analysis. Some of them already exists and they are based precisely on the previously stated results. Thus Sidjanin (2006, p.66), explaining the way of movement of the functional model of an object-oriented system of data banks, that can be applied in architecture and urbanism, says: "A structure of the space hierarchy of an urban environment and its comprehension, based on the Lynch's theory of urban forms and his concept of cognitive mapping is developed for Design Tool." The space hierarchy key starting point of this development process consists of two types of elements, physical structures and psychological elements with forming the cognitive mapping of urban environment.

3. CAUSES OF CHANGES IN URBAN MORPHOLOGY AND URBAN FORM

Urban form is not, within such vision of urban structure behaviour, something that could exist by itself and for itself, on an abstract level beyond all cause-effect relationship in the way of start – development – end – consequences of the urban structure changes. There are opinions, both in theory and in practice, which would like to show architectural and urban form just like an abstract and independent phenomenon, but these gain less seriousness in architectural and urban analysis. Referring to the case of Deol Declaration from 1963, Radović (2005) confirms that the environment of our time does not adjust to the dynamic changes of the twentieth century.. The author further notices two contemporary tendencies - a natural one, where people accept the town more as product of development than the creation, and the second, where many people believe that today we have more opportunities to build a living dynamic system, and concludes that, in order to understand and then build a city as dynamic (flexible, adaptable, changeable and even ephemeral), serious social changes and new forms of life are necessary.

Architectural and consequently the urban form occur as part of the process of internal change, which then, as its name suggests, is displayed as the product, the product of that process. If anything is autonomous and independent in architectural and urban forms in relation to the process of change, those are some flows of its further survival or life in time and space that can be separated from the existence of other change parameters, but it is not just the feature of the only urban form. The urban and architectural form follows the cause of its creation. Form can be presented as something that has no close ties to the cause but the connection can always be found. In the history of architecture and urbanism there are many examples of sudden and rapid impacts and changes that were well accepted over time even though they were initially questionable and problematic. It is difficult to accept the sudden change of urban structure when there is no reason for it. It happens and we react to such changes. However, regardless of our reaction, structures of this kind tend to remain and then the question of their subsequent fitting into the current situation arises. Subsequent acceptance of the problematic structure is asking original and new way of urban action and behaviour. The method is, however, known from earlier - suddenly changing the character of the planned structure in whole or in part, without taking into account the historical content and the value of inherited environment, under the pretext of economic and other needs of environment development. Such changes are not followed by proper analysis of the previous, current and future content, and newly constructed structures usually fail even to justify their existence for a longer period of time. It is not rarely that they are never fully formed, or, if formed, take on elements of the structure and forms which are completely different from the imagined and planned. The synthesis of such changes and consequences, particularly in European urban history, is not easy. Considering the impacts in Europe, Benevolo (2004, p. 10) argues that the problems of physical forms, which originate from various combinations of geographic and historical factors, are associated with documents encompassing diverse fields, difficult to store in a single head and too complex to be formalized as an instrument; these, however, may easily be reduced to a few conceptual categories.

Following the formation and transformation of urban form, imagery that is constantly changing in front of our eyes, causing in us and around us different reactions, we actually read deeper structure, system and organization of the phenomenon of change, its beginning, development and end with all its reasons, causes of justifications and the consequences, accepting the form as a kind of record and the manuscript. Below this record there are parameters that form the natural logarithm of events by which urban structure constantly lives. We generally do not know, do not recognize or at best insufficiently respect the natural logarithm while creating our artificial ones, linking them with natural, considering that if only the natural laws of events are to decide what will occur in some places and how it will look like, urban lives will become a frightening automation without the participation of the human factor. Zite's (2006, p. 27) observation about the construction of a city, which should be both a matter of technique and of art, may be added to this point: "Only in our mathematical century the problem of expansion and renovation of the city became a purely technical issue." Fortunately, with the time people understood and accepted that the art is an inseparable segment of the same natural algorithm.

Since the quality of the space is consciously and unconsciously recognized, its achievement would be the final goal (or one of them) given through the use and the presence of details created on the basis of experiences. A successfully shaped space, and elimination of mistakes that are constantly repeated would be the final results that arises from this work, asuccessful place that creates a sense of peace and pleasure as a planned and project mixture of well-chosen elements and assemblies. The Guide for urban design (2008, p. 30) refers to the correspondance of the proposals to a concrete location and its context, and the type of project. "Whether it is only about the filling of the space, expansion of the previous region of the city

or the project of urban renewal and regeneration... the key of everything is appropriatness, a timely assessment of the factors that will probably affect the feasibility of the project will represent the foundation for the design solutions and checking."

4. CONCLUSION

The basic elements of the morphology of a city and their typology, through the change of ability and relative stability, through the ability to plan and implement, but also through the abolition of border between spontaneous and planned, create dynamic picture of urban structure that is never still. The morphology of a city, in addition to its physical appearance, is also a complex expression of social totality. The change in urban structure is not only a simple physical event in time and space; it already contains reasons and goals of spatial planning, spatial levels and time phases, various classifications and systematizations in the process of planning the urban community. Creating and designing complex compositions of buildings in the environment requires identification, collection and use of a number of different types of information and meanings, from material and physical elements, through economic and legal criteria, social contents, psychology and culture of urban life, to art and aesthetics. The point of this approach to urban, spatial structure is to enlighten the complicated relations of elements and systems through learning about the principles of organization that operate through them. We are looking for the causes and consequences of transformation, its genesis, regulation, self-regulation and thus entering the world of many processes in which the natural codes and methods of human intervention collide. The final product would be the ability not only to detect but also to use information and use a series of segments which would be, as a continuous variable and important cells of information, used for better planning of space, time and place as basic ontological determinants of a city. For this purpose, contemporary forms of IT infrastructure which operates with spatial and temporal attributes, numerical data and time sections would be used. Computer applications, today present in many areas of life, would be unavoidable in future construction of architectural and urban space and creation of new conceptual contents.

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Jernej Vidmar, Janez Koželj: PRILAGODLJIVI URBANIZEM: pristop s parametričnimi kartami

ADAPTIVE URBANISM: A PARAMETRIC MAPS APPROACH

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IZVLEČEK

Velike okoljske spremembe in tehnološki razvoj, ki povzročajo hitre in nepredvidljive spremembe, silijo naša mesta v reorganizacijo in prilagoditev na vseh nivojih. Sodobna mesta postajajo vse bolj dinamična in odprta za prihodnje spremembe, katerim pa tradicionalni operativni instrumenti regulacije zazidave (npr. OPPN/zazidalni načrt) ne morejo slediti. Manjka jim prožnost in odzivnost, ki bi lahko sledili hitrosti in nepredvidljivosti sprememb. Zato potrebujemo bolj prilagodljive metode načrtovanja mest. V tem članku predstavljamo novo metodo načrtovanja in oblikovanja, ki bi lahko izboljšala običajne instrumente regulacije zazidave. Predlagana metoda temelji na t. i. parametričnih kartah, ki omogočajo odprto, prožno in odzivno načrtovanje in oblikovanje mestne zazidave. Parametrične karte preoblikujejo regulacijska določila zazidave v neposreden (interaktiven) prostor rešitev (ang. solution space), znotraj katerega je možno oblikovati in ovrednotiti množico veljavnih variant zazidave. To omogoča prilagodljivo načrtovanje mest, odprto za spremembe v prihodnosti. Da bi ocenili predlagano metodo, smo razvili interaktivno prototipno aplikacijo. Predhodni rezultati kažejo, da lahko z uporabo parametričnih kart, ki opisujejo regulacijske pogoje zazidave, izboljšamo proces urbanističnega načrtovanja in oblikovanja. Nakazujejo tudi, da bi parametrične karte lahko dopolnile običajne urbanistične dokumente na način, da ti postanejo bolj prožni in odzivni, kar bolje ustreza potrebam v načrtovanju in oblikovanju sodobnega mesta.

KLJUČNE BESEDE

prilagodljivo, parametrično, urbanistično načrtovanje, urbanistično oblikovanje.

ABSTRACT

Immense environmental changes and technological advancement, which are causing rapid and unexpected changes, are forcing our cities to reorganize and transform at all levels. As modern cities are becoming ever more dynamic and opened for future changes, the traditional operative instruments of development regulation (e.g. master plan) fall behind. They lack the flexibility and responsiveness needed to follow the speed and unpredictability of changes. Thus, more adaptive city planning methods are required. In this paper, we have presented a novel planning and design method that could enhance traditional instruments of development regulation. The proposed method is based on parametric maps, which enable open-ended, flexible and responsive planning of urban development. Parametric maps transform urban development regulations into direct (interactive) solution space within which a myriad of valid urban design alternatives can easily be created and evaluated. This enables adaptive city planning opened for future changes. To evaluate the proposed method, we have developed interactive prototype application. Preliminary results show that by using parametric maps to describe development regulations, urban planning and design process can be enhanced. They also indicate that parametric maps could complement conventional master plans to become more flexible and responsive, which better responds to the needs of planning contemporary cities.

KEY-WORDS

adaptive, flexible, parametric, urban planning, urban design.

1. INTRODUCTION

Rapid technological advancement, which affects nearly all aspects of our lives, has been changing the way we live. It causes unforeseeable economic, social, and environmental changes that affect our cities, which are consequently being reorganized and transformed. Due to uncertainty and complexity of this process, cities »evolve in ways that are difficult to predict and … city developments, even when planned, tend to find patterns of organisation that were not previously defined in the plans.« (Beirão, 2012, p. 35). To make things worse, cities are also affected by high inertia. This is the result of long-term effects of spatial decisions, which are ultimately reflected in physical form. Once built, transport infrastructure and buildings stay there for a long time. The form of traditional master plans, which represent the final instrument of development regulation, has become too rigid and overdetermined to cope with the uncertainty and dynamics of the changes cities face. Schnabel & Karakiewicz (2009, p. 94) state that it is »too precise, too prescriptive, ... not making allowance for changes.«. »Conventional urban scale master plans lack the flexibility required to account for ad-hoc changes and informal developments. They are static projections of a possible future.« (Henn, 2014). Fixed master plans, which determine specific design in detail, thus hinder development of the city; they need to be frequently amended and updated using complicated, expensive and time-consuming procedures. To confront this intricate problem, we need to develop new kind of urban planning instruments, which will improve flexibility and responsiveness of development regulation (Šašek Divjak, 1999). We need adaptive urbanism, which will help cities stand up against erratic changes that come quickly and unexpectedly. As observed by Ho (2011, p. 5), we need master plans that will »maintain openness, allowing for creativity instead of limiting«.

Although we have already accepted the fact that contemporary city structure should be oriented towards unpredictable changes and continuous alternations, which take place quickly and unexpectedly (Čerpes et al., 2001), we have not yet been able to deal with this complex issue completely. One approach to mitigate effects of unpredictable future is to implement one of several alternative planning systems (e.g. performance-based planning or form-based codes), which emerged over the last half of the century (Goldstein, 2004; Hirt, 2007). These systems were developed to provide a framework that is more flexible and responsive than traditional zoning approach, yet with the same level of certainty (Steele & Ruming, 2012). Nonetheless, it seems that the municipalities tend to avoid changing their planning systems due to many reasons (e.g. high migration costs, education of users or potential legal issues). If they decide to implement some form of the alternative planning systems, they tend to do so only partially by mixing it with the existing system (Elliott, 2008). Another way to address this problem is to unify technological capabilities and practice methods of urban planning and design (Pitts, Farley, & Datta, 2013). For this, »we have to search for a new paradigm in the way of modelling urban form ... from fixed types and pre-determined shapes of elements of the model and to introduce a concept that will be generative as much as it is analytical« (Billen et al., 2014, p. 72).

This search has already begun in the past decade. Researchers around the world are striving to develop new (digitally-based) urban planning and design methods and techniques that enable more flexible and quicker response to unpredictable changes in space and time (Batty, 2013; Beirão, Duarte, & Stouffs, 2011; DeVries, Tabak, & Achten, 2005). Rather than designing a final solution (master plan), we should design its control system (Verebes, 2013a) and let the solution gradually evolve itself through time. According to several authors (Canuto & Manuel, 2010; Steinø, 2010; Schumacher, 2013), parametric approaches seem to be the most suitable to fulfil this task. However, when exploring state-of-the-art case studies (e.g. Halatsch, Kunze, & Schmitt, 2008; Verebes, 2013b; Aydin & Schnabel, 2013), one can easily observe that with most parametric urban planning and design approaches – especially generative ones – users are expected to interact with computer by some form of programming techniques (e.g. scripts or visual programming). This may represent insurmountable problem, since most urban planners and designers are no programmers. Such approaches thus require a team of programmers (or at least designers with advanced computer literacy), which can only be afforded by the largest and/or enthusiast practices. In addition, open-ended master plans relying on programming techniques usually involve a lot of programming work to provide only one-time solutions. Thus, we should aim to develop more general and intuitive parametric planning and design methods.

In this article, we propose a novel operational urban planning and design method based on so-called parametric maps, which interactively regulate the form of development. They represent an instrument that directly connects separated boundary conditions of development to its form. We argue that by using the parametric maps method, we can establish interactive solution space within which numerous alternative urban designs can be created based on the same (fixed) development regulations. This, when implemented properly, can transform traditional static master plan to become open-ended system, which is more flexible and responsive for future changes. New method allows for: 1) quick and transparent creation of many equivalent design alternatives under the same development regulations and/or 2) quick adaptation of urban master plans according to changed conditions in (parts of) the city.

2. THEORETICAL BACKGROUND

To understand how the proposed method works, we first need to explain the difference and conflict between the two basic principles of contemporary urban planning and design practice. Local authorities (municipalities) traditionally set out the general urban plan on a top-down principle (Pissourios, 2014), which regulates city development using 2D maps and text documents. By defining a set of development regulations, they actually create boundary conditions that determine the solution space within which urban development can be designed. Each building of the development must comply with this set of constraints (development regulations) in order to ensure its coherence with the entire urban tissue. On the other side, urban designers take the bottom-up approach as they shape the actual (3D) urban space by placing, spacing and grouping buildings, one by one. Here they observe and evaluate spatial effects of the form and spaces between buildings they are creating. The design process is thus much closer to how

cities actually evolve; as Batty (2012, p. S9) pointed out: »Cities ... evolve mainly from the bottom up as the products of millions of individual and group decisions with only occasional top down centralised action.«.

What we are dealing with here is a complex process that takes place between two (apparently opposite) sides: on one side there are many objective and measurable (quantitative) planning parameters and on the other side there are more specific and subjective (qualitative) design criteria. Although both sides seem different, they are inseparably connected. As is the case with urban planning and urban design, which are essentially the same (Gunder, 2011). Urban designers have to develop their spatial idea in compliance with all the requirements given in the land use plan, set of other spatial planning documents, laws, standards, and norms. These quantitative requirements set out the boundary conditions that define solution space within which the urban designers need to establish high quality relationships between multitude of buildings to form a whole development. Since there is much data involved, it is time-consuming and arduous task to harmonize both quantitative and qualitative aspects of urban design. Use of computer tools is thus inevitable.

Inability to effectively connect these two approaches results in rigidity of traditional master plans. We argue that by using parametric maps conventional master plan can be enhanced to become interactive instrument, which can better react to future needs and desires of the city. This is possible, as development regulations in general urban plan usually do not prescribe exact shape of development. They only set out the rules. If these rules are described properly (e.g. using parametric maps), they can be used to actually propel the creation process instead of limiting it.

In this article, we propose a new, semi-automatic performance-based parametric urban design method that fills the gap between top-down and bottom-up principles of urban planning and design. Using the new method, one can design urban development directly within the solution space, using both principles simultaneously. Working inside this solution space, a move from the design paradigm of 'form making' towards 'form finding' (Otto & Rasch, 1996, cited in: Oxman, 2008) can be made. The proposed method is fully adapted to meet the specific requirements of two-dimensional urban planning and three-dimensional urban design at the same time. It is based on conventional regulation parameters (e.g. building's height or built-up area). Therefore, it can easily be integrated into the common urban planning and design workflow. Since the proposed method relies on instant visual and computationally intensive information feedback, it should be implemented as a computer application.

Before continuing, we also need to illuminate the difference between the conventional (metric) and the parametric design in the context of the proposed method. We see the parametric urban design as a method of modelling the development using the desired goal values, such as number of storeys or gross floor area of the building. This represents the main departure from traditional (CAD) methods, where each building is defined using traditional metric dimensioning, e.g. the building usually defined by the overall dimensions of 20 x 20 x 19 m can also be defined as an 8-storey building with a 400 m² built-up area (Figure 1). The advantage of this approach is obvious, since urban designers have more time to explore various possibilities directly within the desired end result, as they do not need to calculate building external dimensions in order to achieve desired end values.

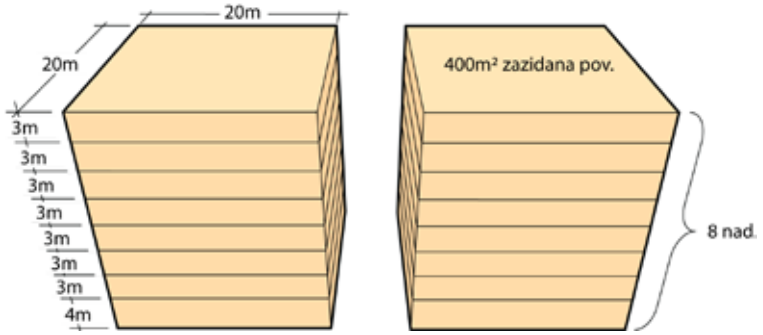

Figure 1: Metric and parametric dimensioning. Buildings are traditionally modelled using standard dimensioning (left), while parametric approach allows for more informative dimensioning using building's end values (right).

3. METHOD DEVELOPMENT

3.1 Parametric maps

A parametric map represents *spatial distribution of development parameters throughout the development area. It acts as a field of rules that regulate properties of development.* The parametric map can be represented by ordinary (RGB or grey-scale) bitmap images projected (geolocated) onto the plot area, where each colour channel represents a selected parameter of the development, e.g. buildings heights or built-up areas. Since bitmap images themselves have fixed range of values (typically from 0 to 255), *span of parameters* values needs to be defined as well. Span of parameters is used to map fixed bitmap value to final parameter value. The building volume should then automatically be adapted based on final parameter values at specific location (Figure 2). To make parametric maps method interactive, it should be implemented as a computer application, which provides instant visual feedback by adjusting building volumes in real-time as they are moved around in virtual 3D environment. This way an open-ended operative control system of urban development regulation can be established.

Parametric maps establish a mechanism that acts on top-down principle, as they make sure that all newly placed buildings follow the regulations of the whole development area. They represent a *solution space* that adapts each building's volume in accordance with its location on site, thus creating a link between a set of rules and the actual shape of the development. Once parametric maps are set-up, buildings (of arbitrary floor plan) can be inserted onto the plot area and adapted (in real-time) as they are moved around the area. This way the development can be designed based on the

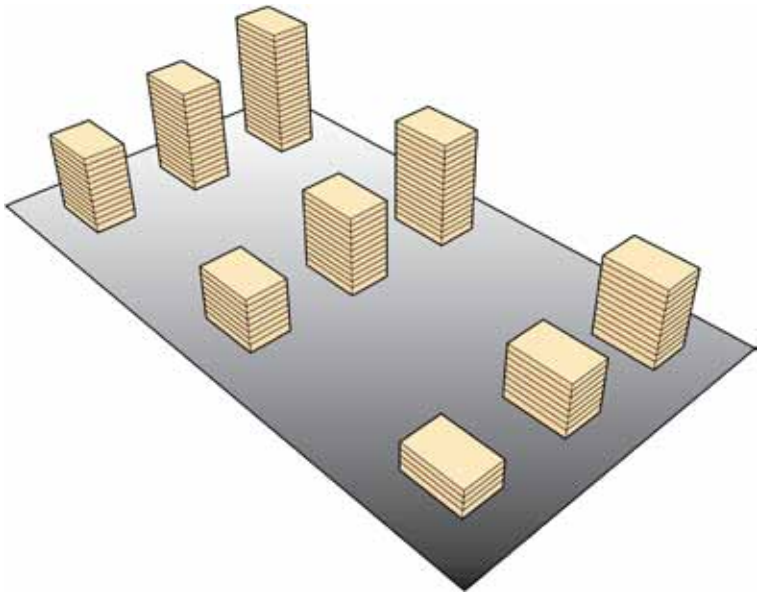

Figure 2: Example of parametric map for number of building storeys. Each building's height is adapted according to its location – white colour of parametric map represents tall buildings and black colour represents low buildings.

bottom-up principle without having to worry if the buildings comply with predefined development regulations – as they actually derive from them! This enhances the creative process and gives more time to check spatial effects of different design alternatives.

3.2 Modus operandi – building heights calculation example

Parametric maps are ordinary bitmap images projected onto the plot area, where the value of each colour channel represents selected parameter of the building at specific location. To keep things simple, we will explain how parametric maps work based on a single parameter – number of building storeys; other parameters, with the exception of land uses, also work in the same manner.

We start with the assumption that the data about the site in question has already been collected. Based on development goals, regulations and site survey, which are usually carried out in advance, one can already decide where the buildings should be high and where they should be low. Based on this decision parametric map that represents number of building storeys (BS) can be created, where black colour represents the lowest values (lowest number of building storeys in this case – BS_{min}) and white colour represents the highest values (highest number of building storeys in this case – BS_{max}), with grey shades in-between:

$BS_{min} \leq BS \geq BS_{max}$

Calculation example

Because the value of building storeys parameter depends on its location on the development area, the building location (LBx,y) – vertical projection of building's centroid – needs to be remapped from absolute space to parametric map coordinate space (PMx,y). This ensures that the proper values are used accordingly to the building's location:

$LB_{x,y} \rightarrow PM_{x,y}$

Note that the building's centroid is used only for picking up the parameter value at certain location. In case when some of the building's exterior walls falls out of zoning area, the user should get an error notification.

The next step is to find out what is the 'raw' value of the parametric map (V) at specific location ($PM_{x,y}$). Using ordinary grayscale or RGB bitmap image, this is somewhere between 0 (PM_{min} = black) and 255 (Pm_{max} = white):

$PM_{min} = 0$, $PM_{max} = 255$
location = $PM_{x,y}$
$0 \leq V_{location} \geq 255$

The range limitation between 0 and 255 is the result of using standard 8-bit greyscale or 24-bit RGB colour model, which are the most widespread among computer applications. However, if higher accuracy is needed (e.g. when defining parameters that have more than 256 values), one could use a file format with a higher colour depth (e.g. 16-bit greyscale PNG format, which provides the range of values from 0 to 65,535). However, this is not the case here. What is important is that these 'raw' values (from 0 to 255) need to be remapped to represent actual number of building storeys. For this, parameters span needs to be defined so that it reflects the lowest and the highest values of parameter. In our example, we have decided that the lowest buildings (BS_{min}) should be 5 storeys high and that the highest buildings (BS_{max}) should be 15 storeys high:

$BS_{min} = 5$
$BS_{max} = 15$

This way the parametric map is instructed to remap the R value of 0 to 5 (storeys) and 255 to 15 (storeys). Any value between 0 (R_{min}) and 255 (R_{max}) is automatically recalculated using a simple linear interpolation:

$BS = BS_{min} + (BS_{max} - BS_{min}) * R_{x,y} / R_{max}$

Since we are calculating end values using linear interpolation, users can choose which colour (black or white) represents which value (high or low). An example to calculate number of building storeys at the location with an R value of 215 follows:

$R_{x,y} = 215$; $BS_{min} = 5$; $BS_{max} = 15$

$BS = 5 + (15 - 5) * 215 / 255 = 13.43$

The building at the location with R value of 215 will thus be 13 floors high (13.43 needs to be rounded to integer). When moved around the virtual model, selected building should be instantly adapted to the required number of storeys according to recalculated R value at given location. The same logic can also be applied to other parameters that define properties of buildings, such as built-up area or building orientation.

In addition to using parametric maps to regulate physical form of development, they can also be used to define non-physical properties, e.g. building's use based on parametric map of land uses. This is of special importance for proper calculation of urban control values as different land uses usually call for different requirements (e.g. requirement for calculation of parking lots for residential buildings differs from the one for office buildings). By using parametric maps of land uses an additional benefit of having a visual overview of building uses across the area is achieved, as each building instantly adapts its colour when moved onto another land use in virtual model. Since land uses are not numeric, they cannot be calculated using linear interpolation method described above. However, by employing direct RGB-to-land use mapping (specifying which RGB colour value corresponds to which land use) this problem becomes trivial.

3.3 Classification of parameters and their relations

In the previous section, we have explained the basic mechanism of parametric maps. However, not all parameters should be applied this way, as they regulate and control the development at different levels. Thus, we have defined different kinds of parameters (Table 1) to structure computer software algorithms and anticipated user workflow. We have separated regulation (input) parameters that are used to define the shape of development directly and control (output) parameters that are used to monitor the current state of development. In the context of input parameters, we have identified three sub-categories of parameters: 1) direct parameters, 2) indirect parameters, and 3) requirements. Each of these parameter categories has some specifics that determines their implementation. Control parameters are more straightforward, as they just need to be calculated in order to reflect the state of development. Nonetheless, we propose they are monitored at three levels: 1) for each building, 2) for each spatial unit, and 3) for the whole development.

Direct regulation parameters are used to regulate building volumes directly at their location in model. They are required to adapt each building directly as it is placed and moved around the virtual 3D model. An example of direct regulation parameters are number of building storeys, building's built-up area, etc. Direct regulation parameters are independent of indirect parameters and requirements, as they do not relate to any other parameter and/or calculation. However, they can be related *interchangeably* (one parameter can replace another) or *interdependently* (one parameter affects another parameter in the same sub-category).

Interchangeable parameters can be best illustrated by connection between building height and number of building storeys, where changing one will also change the value of another. They both have practically the same

Table 1: List of basic parameters. Parameters in italic are not implemented in prototype application. Please note that this list can be extended or reduced to fit the requirements of certain development/ municipality.

REGULATION (INPUT) PARAMETERS	
DIRECT PARAMETERS	■ Building height ■ Number of storeys ■ Gross floor area ■ Built-up area ■ First storey height ■ Other storeys height ■ *Ground floor level* ■ Number of basement floors ■ Building directions (orientation) ■ Land use ■ Absolute min. distance between buildings
INDIRECT PARAMETERS	■ Allowed floor area ratio ■ Maximum lot coverage ■ Mean number of storeys ■ Relative min. distance between buildings ■ *Min. distance from parcel boundary*
REQUIREMENTS	■ Average size of apartment, office, etc. ■ Gross floor area per parking lot / parking lot per appartment (office, etc.) / parking lot per resident (workplace, etc.) ■ Required green area per apartment
CONTROL (OUTPUT) PARAMETERS	
EACH BUILDING / BUILDING PLOT	■ Gross floor area ■ *Floor area ratio* ■ Built-up area ■ *Lot coverage (built-up area factor)* ■ Building height ■ Number of storeys ■ Building volume *Required green area* ■ *Green area* ■ *Green area ratio* ■ Required number of parking spaces ■ Number of apartments, offices, etc.
EACH SPATIAL UNIT	■ *Gross floor area* ■ *Floor area ratio* ■ *Built-up area* ■ *Lot coverage (built-up area factor)* ■ *Required green area* ■ *Green area* ■ *Green area ratio* ■ *Required number of parking spaces* ■ *Number of apartments, offices, etc.* ■ *Population density* ■ *Mean number of storeys*
WHOLE DEVELOPMENT	■ Gross floor area ■ Floor area ratio ■ Built-up area ■ Lot coverage (built-up area factor) ■ Required green area ■ *Green area* ■ *Green area ratio* ■ Required parking spaces ■ Number of apartments, offices, etc. ■ Population density ■ Mean number of storeys

impact on the building (presuming storeys height is defined). In fact, only one can be used, but for the sake of better user experience, we left both options open so that the user can use whichever he or she wants. Relations between interdependent parameters are a bit more complex, as there are several different ways they can be connected.

Interdependent parameters can be best described based on connection between number of building storeys, building's built-up area and gross floor area where one affects another. When e.g. number of building storeys is changed, it suffices to update only one of the two connected parameters – either gross floor area or built-up area. For the prototype, we have set the change of building's number of storeys to trigger update of gross floor area, while built-up area remains the same. Of course, it could be the other way round – when number of storeys is changed, built-up area is adapted to the size that keeps the gross floor area the same. In prototype application, we have already predefined these relations as described in results section (see prototype implementation). Nevertheless, user could also have the option to select different combinations based on own preferences.

Indirect regulation parameters are used to specify performance criteria (goal values) of the whole development area, spatial units and individual building plots. Examples of indirect parameters are allowable floor area ratio or minimum distance between buildings. Indirect parameters can typically be defined for the whole development area or separately for each urban block or subdivision of the development. Although these regulations are not used to define building's volumes directly, they need to be specified in advance as they determine constraints of the solution space. If the development's design comes into conflict with these pre-set regulations (e.g. floor area ratio becomes too high), urban designer needs to be warned about it immediately. Tool using this method should therefore automatically calculate urban control values and check if constraints are not being followed, thus enabling designers to work in line with regulation constraints at all times.

Requirements are parameters that are typically used to calculate the quantities and different kinds of facilities needed to support the development. Examples of requirements are average size of apartment (to assess how many apartments the development will provide) or required green area per apartment (to calculate how much green area is needed to support the development). Requirements are typically related to land uses, as each building use requires different values (e.g. number of required parking lots in residential buildings is different than in public buildings, even though they have same gross floor area). Since requirements do not define values that control physical appearance of development directly, they are closer to indirect than to direct parameters; they affect some of the control parameters that change as the development is being designed.

In addition to regulation parameters, which govern the physical form of the development, we have also classified control parameters that are used to monitor current state of the development as it is being designed. Control parameters represent the data that is needed to take well-informed decisions during the design phase. Real-time calculation and display of urban control values should thus be available at all times during the design phase. They can be calculated in two ways: 1) directly, based on physical state of development (e.g. floor area ratio) and 2) indirectly, based on requirements described above (e.g. required number of parking lots). To gain higher control over any and all parts of development, control parameters should be implemented for each building/building plot, for each spatial unit and as a sum for the whole plot.

4. METHOD EVALUATION

4.1 Prototype implementation

To test the proposed method, we have developed prototype application[1] (Figure 3) in Maya[2] (3D modelling and animation package by Autodesk), using its script language MEL. Basic usage is very simple: the user must first draw a floor plan or choose it from the library of predefined floor plans (e.g. square, circle, etc.). Once the floor plan is chosen, application generates building mass, including the floors. Once the building is generated, users can model the development in two ways. The first approach is to let every building automatically adapt its volume to the parameters defined by parametric maps in accordance with its location. When the building is then dragged around the area, application automatically adapts its volume in real-time based on the parameter values defined at its specific location.

The second way is to 'override' chosen building parameters, which allows for even greater flexibility of modelling the development. Once a selected building parameter is overloaded, it is not influenced by its parametric map any more. Using this kind of parameter overriding (user has to check parameter), it is important to note that one is consciously moving away from the outlined development as defined by regulation parameters. This approach can also be employed for quick visualisation of different alternatives prior to creating final parametric map.

Any change in the parameters, whether for the whole area or a single building, is reflected immediately. Set of urban control indicators, such as floor space area or number of required parking lots is calculated in real-time. We have implemented requirements, which are needed to calculate indirect control parameters, as a part of land use specification. This allows continuous supervision over the entire development and thus promotes performance-based urban design.

For the need of prototype implementation, we have pre-defined relations between interdependent parameters as described hereafter. We have chosen building height – which is the most dominant feature of the building – as our leading parameter, which should not change if not requested explicitly. From this, we have defined the following relations: 1) changing building's height (or number of storeys) adapts also its gross floor area, 2) changing building's built-up area adapts also its gross floor area, 3) changing building's gross floor area adapts also its built-up area and 4) chang-

1 A demonstration video of prototype application, which shows how parametric maps method works in real-time, is available at: http://tiny.cc/adaptive-urbanism.
2 http://www.autodesk.com/products/maya/overview

Figure 3: Screen-shots from the prototype application.

ing building's storeys height adapts also its number of storeys so that it matches building height. It does not make sense to define parametric maps for parameters that exclude each other (e.g., when the storey height is constant, building heights and number of floors provide the same building property, only in a different way).

As an additional functionality, a prototype tool implements experimental function to raise error warnings when the spacing between the buildings is too small. This happens most often due to insufficient solar exposure of buildings or when the buildings are closer to each other than the minimum distance allowed.

4.2 Preliminary results

First internal tests of prototype application indicate that using parametric maps method together with real-time calculation of urban control values enhances urban design process. Increased speed and design flexibility allow for more time to verify alternative development proposals. The main contribution of parametric maps method is that it does not define development's end-state, but it rather sets out the interactive rules within which the development will evolve. Real-time calculation of urban control values can improve the quality of planned development, as one can take well-informed decisions during the early stages of the design process. Authors also observed that the usefulness of parametric maps increases with the size of the development area, and vice versa. It seems that merging top-down and bottom-up approaches into a single design method not only facilitates the early stages of the design process, but it could also contribute to a more transparent and responsible urban planning and design in general.

When testing the prototype tool we have also observed out that design and verification of different development alternatives is facilitated as it enables rapid adaptation of buildings, all within the required criteria. This is an essential component of contemporary urban design practice, worthy of special attention. Since the individual buildings are interchangeable (Figure 4), the flexibility of the design, which complies with the planned development strategy, is increased and various alternatives can easily be tested. Parameters are not used to define the final solution, but rather a well performing solution space within which a designer has to find the best possible solution also in regard to qualitative terms (Turrin, Stouffs, & Sariyildiz, 2013). This is not to say that anything goes, as working with parametric maps method still requires experts with solid urban design knowledge.

Prototype application showed that by using the proposed method, a shift from traditional design towards performance-based design has been made; this (in terms of urban planning and design practice) means that one can work with end-goal values and design the development at the same time. Real-time calculation of urban control values alone can be one of the most useful improvements to the existing practice, where the development is surveyed only once complete solution is designed. Using parametric maps in conjunction with requirements and real-time calculation of urban control values, several variables can be removed out of the design equation, which in turn makes it easier to solve.

We observed these main advantages when testing the prototype tool:

- rapid and transparent design of development alternatives;
- rapid and flexible response to new conditions;
- quick assessment of the development area capacity;

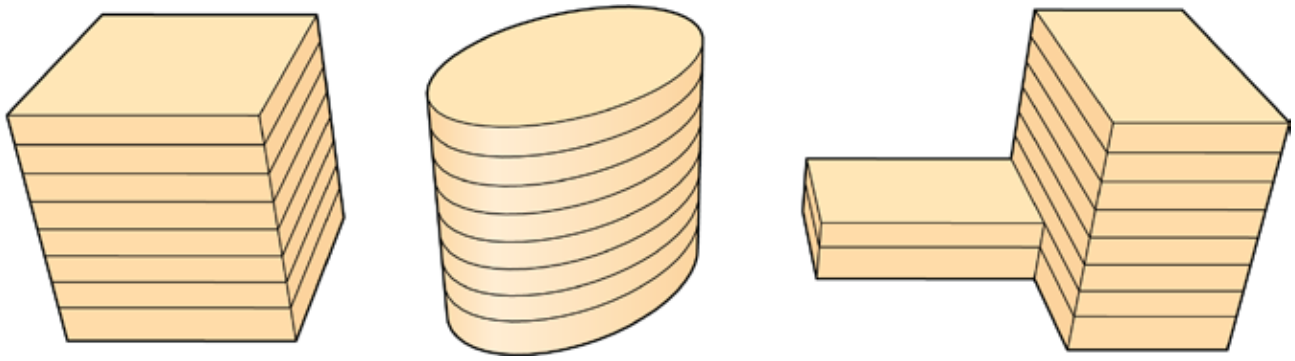

Figure 4: Interchangeability of buildings. Although of completely different shape, all three buildings in this example share the same height and gross floor area; thus one can easily replace another.

- well-informed decision making;
- reduced probability of errors.

In addition to benefits, we also found out some shortcomings of the new method, as implemented in the prototype application:

- preparation of parametric maps can be time-consuming;
- errors in parametric maps or parameters span are hard to detect;
- lack of the tool for direct modelling of the buildings;
- redundancy of parametric maps when creating small scale developments.

5. CONCLUSION

New urban planning and design instruments should focus on coping with dynamics of city development. They should be able to steer diverse investment initiatives and development concepts in accordance with long-term spatial strategy of the city. In this article, we have presented an operational method that achieves this by connecting regulation and control parameters to the final form of the development. Prototype tool proved that parametric maps could establish interactive solution space, which enables creation of numerous alternative urban designs based on the same development regulations. This way the development can remain open for future changes until the time of actual implementation (e.g. getting construction permit). Parametric maps method, which represents operational bridge between urban control parameters and their spatial distribution, should thus be investigated further.

When compared to other emerging parametric urban planning and design tools, parametric maps approach has one big advantage – it provides a general framework that is simple and intuitive to use. This is a great advantage when compared to many other tools, which were, according to Pensa and Masala (2014), not yet adopted in practice mainly because they are technologically too advanced. Parametric maps represent straightforward and transparent way of specifying parameters values visually which can be easily understood by everyone.

Current results imply the possibility of using parametric maps as a highly flexible and responsive instrument to regulate development. Proposed method can be used for both, the design of urban form as well as its regulation. Parametric maps could supplement (or maybe even replace?) fixed master plans and bring urban planning and design to a new level, which better responds to the needs of contemporary city. This will be the main focus of our further research, where we plan to organise several workshops to test the proposed method in practice.

As Lemmens pointed out »One of the most positive aspects of traditional zoning is its predictability.« (2009, p. 127), but it comes at the cost of flexibility. Yet we have observed that predictability of end result is not sacrificed at the expense of flexibility when parametric maps method is used. However, there is one important issue that we have to solve in the future. Elliot (2008) noted that performance-based planning system (which we regard as the closest to the proposed method) was not widely adopted due to the people's desire for predictability. Not because the end-results are unpredictable, but rather as they can sometimes lead to too creative (unexpected) designs, which might not be accepted well by local community. Perhaps we can avoid these kinds of problems by engaging public in early phases of design, but we need to verify this assumption before making any claim.

We can use parametric maps to graphically describe quantifiable properties of the city. From this perspective, we can see them as a kind of city's genetic material, which defines numerous (mostly spatial) properties of the city. Number of parameters directly influences the size of solution space – the greater the number the smaller the number of possible solutions. If all parameters are defined (not all are described in this paper) one could actually use parametric maps to recreate virtual 3D models of existing cities. This raises interesting question about how many and which parameters should one define to achieve optimal regulation level? Which are the parameters that should be mandatory, which can be optional? This is an opened question we also need to deal with in the future.

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Jošt Berčič:
STANJE NA PODROČJU VKLJUČEVANJA JAVNOSTI V PROSTORSKO NAČRTOVANJE V EVROPSKI UNIJI: vključevanje javnosti v prostorsko načrtovanje med teorijo in prakso

THE STATE OF PUBLIC PARTICIPATION IN SPATIAL PLANNING IN THE EUROPEAN UNION: PUBLIC PARTICIPATION IN SPATIAL PLANNING BETWEEN THEORY AND PRACTICE

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IZVLEČEK

Na področju vključevanja javnosti v postopke prostorskega načrtovanja obstaja velika razlika med teorijo v literaturi in implementacijo v praksi. Število objav in publikacij na temo participacije javnosti se je v zadnjih15 letih vidno povečalo, kar prikazuje pomembnost in zapletenost tega področja. V članku je na podlagi pregleda razpoložljive literature narejen pregled trenutnega stanja na področju vključevanja javnosti v prostorsko načrtovanje v Evropski Uniji (EU). Raziskava je osredotočena na tri največkrat omenjena področja v literaturi: zakonodajna podlaga za vključevanje javnosti, odnos ostalih deležnikov v procesu prostorskega načrtovanja do vključevanja javnosti in pregled študij praktičnih primerov. S pregledom literature na teh treh ključnih področjih je v tem članku prikazano trenutno stanje na področju vključevanja javnosti v postopek prostorskega načrtovanja v teoriji in praksi v EU.

KLJUČNE BESEDE

javnost, participacija, vključevanje, prostorsko načrtovanje

ABSTRACT

There is a big gap in the field of involving the public in the process of spatial planning, between the description in literature and implementation in practice. There has been a notable increase of publication and literature on the topic of public participation in the last 15 years, which can be attributed to the importance and complexity of this field. In the article, we will make an overview of the current situation in the field of public participation in spatial planning in the European Union (EU), based on the review of available literature. The research is focused on the most written about areas in the literature: the legislative basis for participation, the stakeholder inclination towards public participation and the studies of practical examples. With the review of participation in those three key areas, the current state of the field of public participation in spatial planning, in theory and in practice in the EU will be shown.

KEY-WORDS

public, participation, inclusivity, spatial planning

1. INTRODUCTION

Learning from the past and the present in order to build a better tomorrow is in human nature. With this thought in mind, an overview of the current state of public participation in spatial planning has been made. The purpose of this article is not to define a new system of public participation, but to show what the current state of participation culture in spatial planning is, so that in the future, improvements can be made.

As the field of public participation is ever changing with the development of new tools and techniques, there is also a significant grout of publications in this area (Petts & Leach, 2000; Maier, 2001; Creighton, 2005; Faga, 2006; Fagotto & Fung, 2006; Callahan, 2007; Sorensen & Sagaris, 2010). A review of literature was made to determine the current state of public participation in spatial planning in the EU.

For the purpose of this article, the ideal public participation process will have to fall under Creighton's (2005, pp. 7) definition of public participation: »…the process by which public concerns, needs and values are incorporated into governmental and corporate decision making. It is a two - way communication and interaction, with the overall goal of better decisions that are supported by the public«: the other authors who tackled the definition of public participation in spatial planning are Arnstein (1969) and Eiter et al. (2014).

Spatial planning is not done according to an individual's vision, but in collaboration by the profession, developers, politics and the public. »It is a well-known notion, that the development of participatory culture mirrors the level of democracy attained in a certain society« (Lah, 2011, pp. 30). Based on this statement, a conclusion can be made that participatory culture is well-developed in all democratic states. These states have provisions in their constitutions, which ought to protect the right of their citizens to participate in decision-making, in case of long-term plans and changes in their space.

The profession's public opinion, which has political consensus, is the following: »Improving the quantity and quality of public involvement in urban design is one of the keys to improving the quality of the built environment« (Mohamed Sameh, 2011, p. 42).

2. MATERIALS AND METHOD OF WORK

Looking at public participation in its current state, the first thing to understand are the conditions under which participation is likely to work and what it can achieve in certain circumstances. Hurlbert et al. (2015) propose the "split ladder" of participation, which is a diagnostic, evaluation and strategic tool for tackling policy problems. Their ladder is a tool that assesses when participation is likely to work, under what conditions participation is needed and suggests that sometimes the outcome of public participation my not lead to a quick consensus. The statement that every case of public participation is unique, and that is should be treated as such with its own set goals and unique process for public participation, is most likely accurate. New tools like the "split ladder" of public participation could be the solution for a more efficient planning of public participation, and understanding of the process itself.

In order to better understand, describe, interpret and explain the current state of public participation in spatial planning, a critical reading of literature has been completed. Because of the multiple case studies and vast amounts of bibliography in this field, the overview was limited to the geographical area of the EU. The literature used in this overview was primarily searched for in the Scopus and Cobiss databases, chosen because of their accessibility on the internet and their free-of-charge use for the University of Ljubljana students. Scopus is a bibliographic database containing academic journal articles, while Cobiss is a national library information system containing a catalogue of bibliographic material in participating libraries. The key search words used in the databases on the topic of public participation in spatial planning in EU were: spatial planning, participation, public, involvement, planning, European Union, examples, legislation, case studies. Because of the vast amount of literature on this topic and to better discern the current state in the field, the bibliographic search was primarily limited to a time period between the years 2000 and 2015. This was done with the aim to get the latest and most relevant examples that could be used to explain the current situation in this field. This limitation also helped avoid examples on this subject that have become obsolete, and shifted the focus of the study to the present. If we want to understand the current state of public participation in EU, we must also look at the surrounding circumstances that helped create it. In this case, the claim is that they are mostly based in legislation and the attitude of stakeholders towards public participation.

It was determined that literature primarily revolves around three themes, important for understanding the current state of public participation in spatial planning, which are: the legislative basis for participation, the stakeholder inclination towards public participation and the studies of practical examples, which show the use of different tools and timing for public participation in practice. It can also be mentioned that according to Bizjak (2012), public participation is divided into formal and informal participation. Formal participation is mandated by laws, for example, the public unveiling. Informal participation is a form of public involvement which is not required by legislation, such as: consultations, gathering signatures, protests, workshops. This paper explores both aspects; the formal in the overview of current legislation and informal participation, which can be deduced from stakeholder attitude towards participation and study of practical examples.

- The legislative basis for public participation and what are the latest additions to it. A review of how the EU legislation translates into policies led by the EU member states has been made. From this analysis, we learn what kind of legislative support the public has for being involved in spatial planning, and how the EU legislation impacts the public participation policies led in the EU member states, as described by Baloh et al. (2014), Conrad et al. (2011) and Verovšek (2012).
- The second area of research is stakeholder inclination towards participation. The opinions of developers, politicians and the planning profes-

sion towards public participation in spatial planning are discussed, as described by different authors. From this, the climate at the stakeholder meetings can be deduced, along with the opinion of those with power over the process of public participation.

- The last segment is dedicated to the studies of practical examples. It shows how theory translates into practice on different public participation examples. Different examples of public participation in content and scale are discussed, while the project Aspern Vienna's Urban Lakeside, currently one of the biggest European urban development projects and an ongoing system of public participation, is discussed in detail.

The combined information from the above mentioned themes represents the current state of public participation in spatial planning in the EU.

3. RESEARCH AND REVIEW OF THE LITERATURE

3.1 Legislative basis for participation

Countries have different legislations on the subject of public participation, which means that the system of public participation is not the same, but in its core, all legislations serve a similar purpose, which should be to give the public an equal seat at the stakeholder table.

To see how the EU has coped with the problem of implementation of public participation in spatial planning, its legislation on this subject was considered. As stated in Verovšek (2012), the key international documents in the field of public participation are: the Aarhus convention (1998), the Bristol accord (2005) and the Leipzig charter (2007), to which Europe 2020 (2010) needs to be added, a strategy for smart sustainable and inclusive growth, which was adopted by the European Commission in 2010, and the European Landscape Convention (ELC), which came into force 2004 and was ratified in 2011 by 33 EU member states and signed by additional five. All directly or indirectly call for the active participation of citizens in procedures of spatial planning and simultaneously warn about the necessity of improving the dialog between authorities, inhabitants and the economic sector. »There is, however, evidence from the literature of a gap between participation rhetoric in policies and participation as practice at the operational level« (Conrad et al., 2011).

Including guidelines from EU directives into the legislation of an individual member state is the duty of each state's current political authority. Therefore, the result of how well the directives are implemented and incorporated into legislation is a reflection of political will and credibility, as well as the state of democracy in a nation. Baloh et al. (2014) write about the differences in legislation in the field of public participation in spatial planning in the EU states. Here, comparison between selected EU member countries on this subject makes it clear that there are significant differences in legislations inside the same framework of directives that have been mandated by the EU.

Differences in legislation between the states are to be expected; each country has its own history and tradition in spatial planning from which its laws are derived. The problem is not the differences between the legislation of member states, but the difference between the states' legislation and the EU-given guidelines. There is too much maneuvering room when applying the standards set for the before mentioned conventions; they are interpreted too loosely during their implementation into a EU member states' legislation. Research has already been made on the state of public participation through the implementation of the ELC by Conrad et al. (2011) and Eiter et al. (2014). They use a 5 step grading process developed by Conrad et al. (2011) to evaluate the state of public participation as described in the ELC. Conrad et al. (2011) write that the problem of the ELC is the various ambiguities in the text of the convention and its explanatory report, which allows for ample room for different interpretations of the precise requirements in practice. De Montis (2014) in his study confirms that the implementation of ELC, as all legislations before it, is highly dependent on local government systems and the traditions that dominate landscape planning.

The laxity of the EU legislation allows different planning approaches to appear in different countries across Europe, which are mostly based on each country's cultural heritage, some more inclined to public participation than others, with the minimum requirements of the EU legislation. As an example, Busch et al. (2009) describe 3 different planning approaches within the EU: Netherlands, Denmark, Sweden.

In the case of EU member Slovenia, Lah (2011) states that the guidelines from EU directives and conventions were completely minimized and inadequately interpreted when they were being incorporated into legislation. It needs to be added that the guidelines in Slovenian legislation are scattered among several laws, which is why they are harder to comprehend and are more open to interpretation, which is not always good. »Public participation in the process of making spatial plans and other interventions in space is a part of the democratic process. However, it depends on the creators of the process, how high this participation will be« (Bizjak, 2012). From the quote, it cannot be divulged that there has to be a will for participation and collaboration, legislation alone is not enough to ensure good participatory practice.

The legislatively mandated rate for including the public is too low. Consequently there are complaints which lead to long-lasting and long-winded processes (Lah, 2011). The public has to be included in the process of planning from the very beginning when the plan is still being formed. Later in the process, most matters are already settled, and changing them would require a long-lasting procedure, which is why the opinions and remarks of the public are generally not taken into account. Because of such procedures, the public becomes unmotivated for cooperation and does not respond to invitations for cooperation in planning in large numbers. This phenomenon can be named: The plummeting of participatory culture.

The EU legislation in its current state, on the subject of public participation, is lacking and leaves a lot of room for interpretation when being incorporated into the member states' legislation. The logical solution for a better and more frequent inclusion of the public in EU spatial planning is a change of the legislation, if not even a new law, which would entirely encapsulate public participation in planning.

3.2 The stakeholder inclination towards participation

We can deduce the attitude of the stakeholders towards public participation from a study done by Falleth et al. (2011) on public participation in urban development in Norway. »The planning administration and local politicians, who represent planning expertise and common ideals, appear to value participation, seeing it as an important part of democratic decision making process. Developers are far less likely however to view community participation as an important element of the planning process. They rely to a greater degree on an economic rationale, with planning seen more as a necessary administrative check-box before construction can get under way« (Falleth et al., 2011). From the Falleth et al. (2011) study, it can be deduced that not all stakeholders in the process of spatial planning feel the same way about public participation and its role in decision making. It is apparent that there is an ongoing struggle in the process of public participation between capital and human rights, which we can call a crisis of values. In the case presented by Felleth et al. (2011), we can see the before-mentioned crisis of values, where the opinion of the capital matters more than the consensus of the people.

In his study, Connolly (2005) addresses the inefficiency of the public participation system, the view of politicians and policy makers: »Policy makers naturally act to protect and promote familiar kind of public involvement: local, limited in its participants, late in policy-making processes, consultative and rather than binding and involving issues that are not challenging to the mainstream of the local authority. Moreover, behind the scenes processes control what can be discussed and what action is taken as the result of discussions taken in public forums, all framed within limiting sets of ideas either explicitly or unconsciously put in to place by the initiators of the process«.

This article will focus mostly on the planner, as the one with the most expertise in this field and as the person involved in the project that should maintain neutrality to all stakeholders in the process; the planners' only goal should be the quality of the project. However, maintaining neutrality and complete professional focus is difficult, because the planner is often in the employment of the developer of the project, whose goals are usually purely economic.

The prevailing view is that the public should be included when this is explicitly required by law. It is well known that public participation makes the planning process longer and more expensive. Nonetheless, we as planners are obligated to include the public, because ethics demands this from us (Ogorelec, 1990). Our opponents on this point are always going to be capital and politics, which accelerate the planning process to execution, even though that is not always in their own interests. According to Douglass et al. (1998), planners are put under pressure. »Choose the community and you are choosing professional death. Choose to work for the state and you retain your professional identity, but don't delude yourself about whose interests you are serving« (Douglass et al., 1998). Planners have to conduct their work objectively and have to act strictly in accordance with professional and moral values, only in this way they can justifiably and suitably do their work.

Falleth et al. (2011) argue that the problem with the attitude towards participation starts with the planning theory. »The planning literature tends to see the planner as the core actor in planning and planning as a universal tool for development. The planner is not the conductor in planning, and planning is one among many processes in urban development. We argue that much that passes for planning theory has, in reality limited the focus on important actors, processes, power and interrelations in urban planning research« (Falleth et al., 2011).

If the statements on planning theory by Falleth et al. (2011) are accepted, that could translate into the attitude described by Ogorelec (1995, pp. 11): »Many spatial planners consider their work as expert-technical, which can only be done by experts. The interference of laymen endangers the profession's autonomy and causes the degradation of urbanism and architecture«. Unfortunately, people in positions of power who believe that their work is untouchable and irrefutable can always be found. Nowadays the profession teaches us that: »Public participation is a key requirement for social acceptance of spatial intervention and with that for the realization of plans, for the success of spatial planning outturns, discipline and respect for legal norms in space as well as humane urbanism in general« (Pogačnik, 1999). In spite of this, most planners hesitantly prepare to cooperate with the public, since the disadvantages of participation are often reverberated louder than the advantages.

»The idea of citizen participation is a little like eating spinach: no one is against it in principle because it is good for you« (Arnstein, 1969). Ogorelec (1990), Pek Drapal et al. (2001) and Pogačnik (1999) wrote on the inherent positive and negative sides of public participation.

However, regarding uncertainty about participation when we have an unpredictable variable such as the public in the equation, we have to rely on Habermas concept described in Douglass et al. (1998) named "The leap of faith", involve the public and enable them to have as much decision-making power as possible, while giving them the benefit of the doubt that they will be working with the best intentions for the greater good.

3.3 Studies of practical examples

It is evident from the literature that the selection of the tool used for participation has the biggest impact on the scale and type of public participation. Many authors are doing research and developing new digital systems for participation (Goodchild, 2007; Tulloch, 2008; Boroushaki et al., 2010; Brown et al., 2014). However the human factor in public participation should not be forgotten, the best public involvement should still be based on human contact: workshops, roundtables, interviews... Technology should be viewed only as a tool that is used to achieve the desired result. There is a danger that preoccupation with technology will distract from the effort, required to meaningfully engage the under-represented people in the land use planning and management. Effective public participation requires more than innovative technology (Brown et al., 2014).

Arciniegas et al. (2012) describe the use of an old approach in the land use planning but with the use of new tools for public participation. They

put forward a question: How can spatial decision support tools meet the requirements of a collaborative land use planning workshop? They describe a series of collaborative land use planning workshops for a peat-meadow polder in the Netherlands. Stakeholders were invited to work together and carry out planning tasks using spatial decision support tools implemented in an interactive instrument the touch-table, at three workshops at different points of the land use planning process. The implementation of the touch--table yielded positive results by quickly and efficiently informing and educating the public on the proposed plan.

Busck et al. (2009) look at different planning in Roskilde municipality in Denmark, Staffanstorp municipality in Sweden and the WERV area in the Netherlands, all of which represent different advantages and disadvantages. » A top-down planning approach may ensure uniform and efficient implementation of planning policies by lower planning tiers, but may disregard local needs and differences. On the other hand, while a bottom–up approach may be more responsive to local need, it may also weaken effective planning and locally based decisions may be in conflict with national interest« (Busck et al., 2009).

Ledivin et al. (2010) study of the Botanique structure plan in Brussels goes into details of the informal part of the public participation process. In their opinion, timing is important for the most effective public participation to occur. The launch of the structural plan happened in the morning at a press conference open to all. The nearest residents were personally invited to attend an afternoon cocktail party, to discuss the proposed plan in an informal setting. After that, a series of participation workshops and informal meetings were conducted, which showed a struggle between the public and private sector. Through the media, it became clear that wheeling and dealing was going on at the informal meetings. At the second stakeholder meeting, tempers were high because of public distrust and sense of betrayal towards the other stakeholders, which led to the third meeting being canceled and the implementation of a top-down planning system for this project. According to Ploštajner (2003), the situation which has arisen can be attributed to poor communication among the ones involved, especially when the public is poorly informed or has a feeling that it is in an inferior position, that their remarks and arguments will not be heard or taken into account. In such cases, it can happen that a project is rejected in advance. Despite this, we have to remember that: »Resolving conflicts through dialog is one of the main characteristics of modern democracies. The public has a recognized status as a partner and that is why the process of participation is more important than the results« (Pek Drapal et al., 2001). Ledivin et al. (2010) conclude the study with the thought that keeping the public and private sector at the same table talking is an accomplishment in itself and that clear rules have to be set at the start of the process -what is open to deliberation, what is negotiable and what is not.

This article takes a closer look at the Aspern Vienna's Urban Lakeside project, which is located in Austria. It was chosen because it is currently one of the largest ongoing development projects in Europe and has already received awards and mentions for spatial planning and the involvement of the public. The area of the development covers 240 hectares of a former airport in the northeastern part of Vienna. Planning began in 2007, the start of construction was in 2008, with the scheduled completion of the project in the years 2024 to 2030 (Aspern et al., 2013). The aim is to create a new, multifunctional urban quarter for Vienna – with apartments, offices, service providers and an industry, science, research and education quarter.

Before the project began, the investors and planners set two main guidelines, which they believed needed to be followed in order to create a city of the future. They believed that planning should be organized as the city itself: multifaceted, multifunctional, transparent, open... and besides that, there was a need to build on the identity from the outset of the project, even before it was realized. They believed that the identity is built on co-operation, through dialogue, and its aim was to achieve a space of shared values, actions, and respect (Johannes, 2009).

The public was involved in the planning process in the early stages of the collection of basic concepts, in the so-called City labs. Various stakeholders were invited to participate in discussions, with the aim to provide their opinion on the project. Concurrent with the first presentations of the conceptual project, a workshop for the creation of brand visibility of the project brand was organized, which later made it easier to present and promote the project in public. This phase was also open to the public. For a productive dialogue with the public they needed a good basis. To this end, they produced a study of the environmental impact, a traffic study, a mobility study, etc.. Professional projects and studies were presented at the round table and are always on display in the information center, which is located in the construction area. To bring the project closer to the public, they needed to ensure the transparency of the process and to attract the existing residents, so they could identify with the space on the location itself. To this end, they allocated parts of the construction site for land art exhibitions and workshops (Johannes, 2009) and opened them to the public.

The project Aspern Vienna's Urban Lakeside is being carried out according to the expected schedule, with a relatively strong support of the local community. This success can be attributed to the project due to the early and comprehensive public involvement, openness and transparency in all phases of planning and construction, good creation of brand and space identity, to which the public can form an attachment, and the innovative way of promoting the project already prior to construction. The method of the inclusion of the public in the planning process does not merely follow the law, but builds on it. The designers of this project believe in the slogan that the settlement in the future will be built with the people for the people.

Methods of participation vary depending on the type, scale and location of the project as well as resources and time allocated for public participation. In the study which looks at different case studies on planning approaches for urban areas in multiple countries, Busch et al. (2009) come to the conclusion that the results reveal significant differences in approaches, reflecting variations in the public involvement in urban planning.

4. DISCUSSION

From the overview of the literature in the three key areas that impact public participation, it can be concluded that public participation in spatial planning is currently at a breaking point between defining public participation and implementing that theory in practice.

The overview of legislation showed that the participation process is currently not sufficiently regulated by law in the EU; the problem is that too many areas are left open to interpretation. Each EU member state interprets the EU legislation differently and then they incorporate it into their national legislation, which leads to variations of the public participation process conducted in different states. There is also a lack of a coherent system which would help determine in which situations public participation is probable or even possible and what are the likely outcomes; an example of such a system is proposed by Hurlbert et al. (2015) in the "split ladder" of participation.

If participation relies on the interpretation of the legislation of the person in charge of the planning process, then it can be said that public participation highly relies on the will of the people in charge. The current stakeholder opinion on public participation, according to the reviewed literature, is:

- Developers are mostly against participation; their main interest is purely economic. The developers are afraid of unforeseen circumstances when involving the public, which can prolong the development of the project, make them miss their deadlines and increase project costs.
- Politicians have a mixed feeling about participation; they just want the public consensus, not a two way dialog. Their aim is to finish the project as smoothly as possible and in-depth public participation process could bring forth issues that aren't in their best interest.
- Planners can be divided into two categories; some think that their work is untouchable and irrefutable and view public participation as a necessary evil dictated by legislation, and others view participation as a way to gather more information and opinion to legitimize and better the project. Planners also have a problem because they are trapped between the developer who wants to expedite the process, and their professional moral code. There is the question whether the planners would be more inclined towards public participation if they had a better legislative basis to fall back on when presenting the planning process to the developer.

From the growing number of literature on the subject of participation it can be deduced that, in academic circles, there is a growing awareness of the importance of public participation and the gap between theory and practice. Even now, the stakeholders do not oppose participation; they are against the things that come with it in the current situation: delays and resources. It can be predicted that the stakeholders' opinion will probably change in time and there will be more examples of good practice, which will help optimize the process of participation.

In practice, public participation process varies from project to project, as shown in the examples from the literature. However, incorporation of the public in to the planning process appears to be getting easier in practice, due to the development of new tools and techniques such as the touch--table, City labs and branding process. It can be observed that in the current state, most of the public participation process is conducted in the form of an informal process, with the will of the stakeholders to go beyond the legislative framework of public participation.

It was surprising that so many processes and tools were developed to involve the public, most of which are being successfully implemented at different stages of the informal planning process. What is lacking is the legislative system – the framework for public participation, which would allow for the use of different tools at different stages depending on the projects needs.

5. CONCLUSION

This article discusses the current state of public participation in spatial planning in the EU. The review of the literature in three key areas was used to determine the surrounding circumstances that helped create the situation that we have today. The current state of discord in this field represents the first step from theory into practice. A common saying applies to the current state of public participation in spatial planning: for there to be order, there must first be chaos. The review of the literature and the examples show some existing obstacles in this area, which need to be overcome in order for this field to advance. With frequent legislative changes and the development of new tools, public participation is an ever changing and growing field, which will get more defined and better managed in time and with more experience from practical research.

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Maurizio Bradaschia: STARO PRISTANIŠČE MESTA TRST: Stoletje projektov in predlogov za nerešen problem

THE OLD PORT OF TRIESTE: A CENTURY OF PROJECTS AND PROPOSALS FOR AN UNRESOLVED ISSUE

DOI: 10.15292/IU-CG.2015.03.062-067 ▌UDK: 711.453.4 ▌1.19 Razprava / Discussion ▌SUBMITTED: May 2015 / PUBLISHED: October 2015

Two major unresolved issues of the past two centuries for the city of Trieste: "cittavecchia" (the old medieval town) and the old port.

While the first, after more than a hundred years of decay and neglect has finally arrived, thanks to a shared political will to a good start-up phase: many buildings, thanks to European funds, since 1998, have been recovered and, despite the work cannot be regarded concluded, "cittavecchia" returned to be part of the historic center of Trieste, the same cannot be said for the old port.

Built on a single project signed by the French engineer Paulin Talabot, between 1860 and 1900, the old port of Trieste, once completed, immediately showed its inability to perform the functions for which it was designed and built: storage techniques, the size of the store, geometric relationships and, more generally port mode changed very rapidly from the mid '800 to early '900, had necessitated finding new areas for the port facilities in the Habsburg city of Trieste.

It is by the early 1900s, in fact, that begins the construction, southeast of the city center (in diametrically opposite the old port), of the new port.

So, an area of approximately 60 hectares, 42 stores for a volume of about one million cubic meters begins its slow decline.

This is an area close to the historical center of the city, an area of access to the city itself, located along the coastal strip, bounded by walls which enshrine the membership to the State and the regime of free point by excluding it from city life.

Looking from above, it seems almost a fourth neighborhood of the »village of foundation« coming from the nineteenth-century, such as the neighborhood teresiano, giuseppino and franceschino that contribute markedly to mark the image and the face of the city.

Towards the end of the 80s, followed a series of projects for the recovery and redevelopment of the area, with dissimilar approaches and objectives, projects that make a mosaic design of some interest for the city and contemporary architecture.

The first of these (with reference to a contemporary chronicle) is that one processed by **Nicolò Savarese** for FIAT in 1988: the Polis project. This is a project proposal with an example hypothesis of town and infrastructure planning based on a zoning that spends the head of the old port attached to the historic center in the following way: a storage area, a Research Center, an Exhibition Centre, a Financial Centre, an urban park is connected to the Piazza della Libertà, opposite the railway station, a Directional Neighborhood, a Financial Center and a Water Square sessions sloping towards the sea from the arguably circular shape.

It is a project qualitatively mediocre that, if realized, would probably distorted the urban part of the old harbor.

By far the most interesting proposal drafted by **Luciano Semerani** 1990, that starting from a proposal to raise the whole coast area of the Province on behalf of the Company Bonifica Spa (IRI Italstat Group), formulate a draft certainly more compelling, where central element is the header node architecture that links the port facility to the city.

Fascinating and certainly recall Loos building in echelon on the sea with hotel function. A project that fits well into the historic fabric of the city and re interprets skillfully and in a contemporary way, empty and full.

Follows the hypothesis of **Gino Valle**, 1991, that at the time was commissioned by the Generali Insurance Company that would have like to accomplish in that area their »headquarters« and that later, because of the amount of difficulties, preferred to move to the anonymous but certainly less complex, Mogliano Veneto (VE).

The Valle project breaks down the orthogonal grid of the neighborhoods of the nineteenth century and works on perspective axes and cuts on blocks, showing the precise moment in the history of architecture: a real "state of art" project.

From 1997 is the proposal made by the then President of the industrialists of the Province of Trieste, Federico Pacorini, through the association Trieste Futura, which called the architect **Manuel de Solà Morales**.

The Morales project seeks to strengthen together the new port (commercial) of Trieste with the semi retired "timber terminal" to recover the abandoned areas of the old port with different purposes. A reintegration project that attempts to enhance the urban housing stock and the connective spaces to promote a series of social and commercial activities and streamlining of the road infrastructures.

Even this great project cannot find the fortune deserved, probably due to different orientations of the Port Authority that relies, through the company Portovecchio Srl, a project of transformation of the same area made by **Stefano Boeri**.

It is, then, the time of the attempt of Boeri, called by Maurizio Maresca, the President of the Port Authority. Boeri project is grafted on the assumption of P.R.U.S.S.T. (an urban program of renovation and urban transformation based on sustainability, then definitely changed later by the Administration and funded by the Ministry of Infrastructure and Transport) prepared by the "Illy administration" since the end of the 90s, which provided the bypass of the historic center and the connection between the two ports (the old port and the new port) via an underwater tunnel.

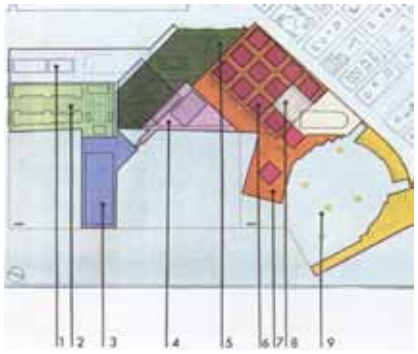
With regard to the old port, Boeri expected, abolished the fences of the harbor, the creation of a green space of relationship between the old harbor and the teresiano neighborhood, a system of entrances, from both the station and the old city, and a pedestrian link between the old port and the town banks.

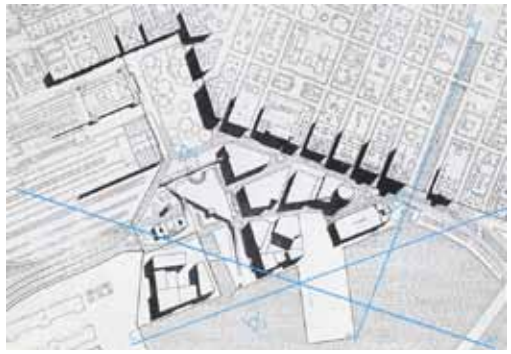
The project also included a receptive tourist attraction, with an hotel, a large conference space, a city of children, an exhibition space linked to the sea, a multiplex cinema, shopping areas, a great area for boating. The intention of Boeri was to ensure a strong relationship with the city center by locating functions in strong gravitation. The project also included a center for research, development and training.

The years immediately following are characterized by two additional projects that in some way affect the old port. One by **Aires Mateus** and another one by **Mario Botta**. Neither of great importance for several reasons: first, because commissioned by private individuals, by some manufacturers to Mateus and by the Company Greensesam to Botta, apparently under the suggestion of Vittorio Sgarbi.

Secondly, because if the project Mateus mainly affects areas north of the old port (the embankment of Barcola), the project by Botta refers only to the creation of a single office building.

Old port site in Trieste.





1988 Project by Nicolò Savarese **1990** Project by Luciano Semerani **1991** Project by Gino Valle **1997** Project by Manuel de Solà Morales

In the early 2000s, during the first post "Illy Administration", something new happens: the Port Authority and the City Council approve similar guidelines to change the structure of the old harbor. We are in the year 2003. The idea is to expand and enlarge the potentiality of the old port to allow the settlement of functions also of a »city center«.

About this, in particular, also from the political point of view, I have already mentioned in other writings. What is important, however, is that the hole city will there was a consensus shared and expanded: the City Council voted unanimously to approve the resolution to address the variation of the Mater Plan of the old port (now in force), which was assigned to the undersigned (**Maurizio Bradaschia**) and **Alberto Cecchetto.**

The variation of the Master Plan relative to the areas of the Old Port covers an area of approximately 60 acres located north of the historic center of Trieste.

This is an area directly administrated by the public administration system in the maritime domain, which is, however, expected to be used, under the rules of the public uses of the sea.

With reference to Resolution No. 18 of 16.4.03 containing the guidelines issued by the City Council in the preparation of the variant itself, this has been set considering the totality of the area as a »part« of the historic city center, given the characteristics morphological and typological that characterize the Old Port. A sort of »fourth« neighborhood of the nineteenth-century foundation, coupled with the teresiano, giuseppino and franceschino; a piece of historical city to conquer following the logic of urban progress, identifying new goals and new activities that will give to the city the existing assets.

A logic and an approach marked by appropriate and flexible functions, correct, more specifically urban, and integrated into the surrounding historic city in a vision of the overall functioning of the entire city of Trieste.

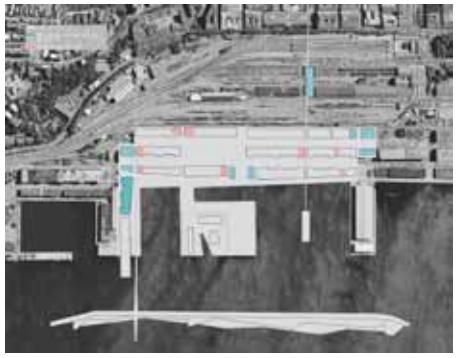
The variant of the **Master Plan** also started from the note received on 10/28/02, prot. 140842 with which the Port Authority of Trieste broadcast »for all matters pertaining to« Resolution 23/2002 of the Port Committee with which the Committee established for the areas of Porto Vecchio: »The maintenance of the terminal functions within the Old Port only while supplies last, or until the insured would have been an arrangement similar to that in place - under the operational continuity - in the areas of the new Port or inclusion of industrial and other support activities like residential (lofts, residences of support, university guest houses, boats, etc.).«.

The result is a variant of a transformation of the set of uses which involves the disposal, in some cases, over time, the prevailing port functions for the benefit of other activities that more properly urban and cultural activities, research, education and training, management and service, commercial, hospitality, exhibition and entertainment and limited residential functions of service and support, complementary to new uses as defined above, including, among other things, the maintenance of port terminal functions in the Old Port, temporarily, in the area of the so called Adriaterminal.

Simultaneously with the preparation of the **new Master Plan** of the site, after several years of preparation, Trieste Expo Challenge Spa (a mixed company comprising various government) candidate the city to the »recognized« (specialized) Expo in 2008.

Two competing cities: Zaragoza and Thessaloniki.

The mandate for the preparation of the Master Plan was assigned to the writer (**Maurizio Bradaschia**) and **Alberto Cecchetto**.



1997 Project by Stefano Boeri

Project by Maurizio Bradaschia and Alberto Cecchetto

Project by Maurizio Bradaschia and Alberto Cecchetto

"Mobility of knowledge" was the theme chosen by a group of scientists and scholars to represent the Expo 2008 in Trieste.

The potentialities of Trieste were and remain indisputable and the theme, that of mobility, as it seemed very apt for the Italian situation and condition, and Trieste, and the international relationships that has itself among many countries, and that these (the mobility of knowledge, first), in turn, entertained and entertain with the scientific reality of Trieste.

It was estimated that a total number of 90 participants would come to Trieste for Trieste EXPO 2008 ITALY. Divided among 60 exhibitors, the Italian Government, 3 National Bodies, 1 "Piazza Trieste", 25 international organizations.

Participants would be made available to a covered area of 500 square meters. Area that would have been obtained in the warehouse of the Old Port and equipped with all the facilities for receiving plant composition of the individual participants. The Italian Government, the National Bodies, "Piazza Trieste" and 25 international organizations would have benefited from their dedicated spaces.

Would have been set up, in addition, thematic pavilions.

The functional organization of the Expo, the draft Master Plan sought congruence with the original layout of the Old Port of Trieste in the interests of consequential logic with the urban structure of the entire historic city of Trieste.

It sought the wider sustainability, respect for the values and preexisting present in port without affecting urban equilibrium.

The Expo project was seen as a function of the re-use of an urban area of the town center abandoned, recovery that saw, in the Expo, its main engine.

It was also conceived as a place of explication of the theme and its meaning, in the invention of the accesses, of course (it was a unique and continuous thought out with extreme clarity and rigor, in unequivocal lead the visitor through the space and composition both internal and external), especially in the construction and installation of the thematic pavilions.

The project was organized in a main enclosure, covering an area of 25 hectares, where to existing buildings that housed mainly the 60 pavilions of countries exhibitors were joined by new structures, both permanent and temporary, hosting services, fun recreational activities, an outdoor theater, outdoor exhibition areas, pavilions for sponsors and, in the central beachfront, a conference center which was matched to a structure called the »Palace of Inter Cultural«. It was the realization of a multi-Convention Center aims to meet the needs of the Expo, and more generally the entire city; tangible sign of future memory and experience Expo.

An underground car park on three levels located in the center of the area was capable of 3,000 parking spaces.

The breakwater area overlooking the Expo area was reused as services and hosts for bathing areas on two different levels towards the sea, a »promenade« with services for the receptivity to a higher level, and a dock with a distribution box and small stores serving the yachting activities of which are based here.

Unfortunately, despite these efforts, the Expo was given to the city of Zaragoza and the investment did not take off.

The next master plan by **Norman Foster** (actually drafted by the Company Systematica SpA, remained, despite the prestige of the designer, rather mu-

Project by Norman Foster **2006** Portocittà

ted) provided in the area of the old port are basically two macro areas:

- The first urban park at the embankment of Barcola and the current area of the sea baths;
- The second urban area of the bank at the side of the old port closest to the city.

The project was characterized by the plausibility of the changes in the short, medium and long term, considering the area of the old port is the port area as that part of the city waterfront.

Although this hypothesis after 2006, did not hesitate lucky.

Finally, a project of little interest from the design point of view, I would call speculative in nature, prepared by two giants such as building contractors Rizzani de Eccher and Maltauro through the company "Portocittà" mainly oriented to a pension rather than a careful transformation of areas, also dropped last month of March 2013, thanks to the housing crisis and the usual objective difficulties due to the presence / validity of the free port and the state property that is certainly not easy and I doubt facilitate short reuse and transformation of this area, born old and remained in a sort of limbo for over a century.

This article from the magazine "Edilizia e Territorio" dated March 1, 2013 well explained the situation:

»03/01/2013 - redevelopment

Trieste, hangs the restoration project of the Old Port

The recovery of the Old Port of Trieste, age-old question that has been going on for decades, it crashes. Portocittà, »for factors beyond their control - assured - is forced to stop the activities covered by the grant for the redevelopment of the old port of Trieste«. The Board of "Portocittà", a consortium of banks and entrepreneurs, has informed the Port Authority last February 22 and announced that it will protect the material interests and reputation of the company by initiating legal proceedings in the competent "Regional Administrative Court". The decision to leave is accrued, the company said, »as a result of the acknowledgment of the impossibility of continuing the development of the project due to the continuation of the regime of general uncertainty that has characterized the recovery of the Old Port«. In particular, Portocittà states that the problem of free port regime has not been addressed with the determination needed to ensure the development of a project so challenging and important for the revitalization of the entire city of Trieste. Portocittà recalls having invested in the project about 10 million euro to develop the project. Ten million euro that the consortium intends to recover through the appeals. The Port Authority of Trieste has ensured battle«.

UVODNIK
EDITORIAL
ČLANEK
ARTICLE
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PRESENTATION
DIPLOMA
MASTER THESIS

Kristijan Lavtižar, Ilka Čerpes: JOHN NASH – REGENT STREET: mestna prenova s kraljevo pomočjo

JOHN NASH – REGENT STREET: URBAN RENEWAL WITH ROYAL SUPPORT

DOI: 10.15292/IU-CG.2015.03.068-076 ▮ UDK: 711.5 (410.111.11) ▮ 1.04 Strokovni članek / Professional Article ▮ SUBMITTED: June 2015 / REVISED: September 2015 / PUBLISHED: October 2015

IZVLEČEK

Regent Street je obsežen urbanističen projekt Johna Nasha (1825), ki zadostuje več kot le estetskim zahtevam. Ta ulica, v staremu delu Londona, predstavlja prometno žilo, turistično atrakcijo in svetovno znano nakupovalno četrt. Arhitekt je v projektu pustil sledi svojega teoretičnega znanja, odločnosti in iznajdljivosti, kar se je manifestiralo v premišljenem načrtu, ki danes tvori enega lepših londonskih ambientov. Članek je sestavljen iz kratke biografije avtorja in razlage družbenega ozadja, opisa samega načrta in pomena v urbanizmu ter avtorjevega komentarja.

KLJUČNE BESEDE

Regent Street, London, John Nash, urbanizem

ABSTRACT

Regent Street is a comprehensive urban project by John Nash, from the year (1825). In its irregularity, it is fulfilling more than just the aesthetic demands. This street in the centre of London, represents a traffic vein, a turist attraction and a world famous shopping destination. The architect of the project left a marck of his theoretical knowledge, determination and ingenuity, which has manifested in a thouthfull plan, that now forms one of the most wonderful ambients of London. The article consists of a short biography of the architect and interpretation of plans social background, a detailed description of the plan itself and its importance in urban planning and author's commentary.

KEY-WORDS

Regent Street, London, John Nash, urbanism

1. UVOD

Londonski Regent Street, je del obsežnega razvojnega projekta Londona iz začetka 19. stoletja.

Naloga rekonstrukcije starega dela mesta in oblikovanje novih elitnih stanovanj je bila zaupana talentiranemu arhitektu Johnu Nashu. Deloval je pod pokroviteljstvom nekdanjega angleškega kralja Georga IV., za katerega se je ulica načrtovala. Z njeno izgradnjo so Londončani dobili svoj prvi bulvar.

Na razdalji poldrugega kilometra je ulica povezovala kraljevo administrativno letno hišo Carlton in park St. James, s počitniško rezidenco v Regent's parku. Zaradi kontroverznega črpanja javnih financ jo je širša javnost sprejela hladno, in še desetletja po izgradnji je privabljala zlasti premožnejše sloje. Iz vidika urbanega načrtovanja je projekt pomemben zaradi radikalnega zarisa nove velike mestne vedute v stari del mesta in uporabe nove oblike luninega krajca v mestnem kareju. Projekt je imel štiri pomembne igralce: arhitekta, ki si je na vso moč prizadeval uresničiti svoje načrte, dobro lokacijo, akt parlamenta iz leta 1813 ter približno milijon funtov, kolikor jih je bilo takrat potrebnih za izvedbo.

Regent Street je zaradi lege, merila in družbeno-prometne vloge v mestu znana tudi kot Royal Mile, ali kraljeva milja. Vsebinski program je mešan, največ površin pa je namenjenih trgovini. V raziskavi sem preučeval njen nastanek in povezanost z mestom. Pri tem sem uporabil pisne vire, javno dostopne internetne pisne, kartografske in fotografske vire ter avtorske analitične karte. Projekt sem opisal z zgodovinsko analizo njegovega nastanka od zamisli do izvedbe in vrednotil s primerjalno analizo izvirnih ciljev projekta z njegovimi dolgotrajnimi učinki na ustroj, podobo in funkcioniranje mesta London. Za namen vrednotenja sem primerjal numerične, opisne in oblikovne kazalce.

2. ARHITEKT JOHN NASH

Arhitekt ulice Regent je Britanec John Nash. Deloval je pod okriljem kralja Velike Britanije in Irske, Georga IV. in še danes velja za enega pomembnejših tvorcev arhitekturne in urbane podobe Londona.

Rodil se je 18.1.1752 v kraju Lambeth, na jugu Londona. Nash je bil vajenec pri arhitektu Robertu Taylorju od 1775 do 1776. Poročil se je leta 1775 z Elizabeth Kerr, ki mu je povila dva otroka. Zakon ni trajal večno in na novo se poroči leta 1798, z Mary Ann Bradley (Carradice, 2013). Njegova kariera je bila sprva negotova. Leta 1778 je podedovan denar vložil v gradnjo svoje prve hiše Bloomsbury, ki se ni obrestovala in Nash je zaradi nje in neporavnanih dolgov svoje prve žene Elizabeth razglasil stečaj leta 1783 (Summerson, 1980). Lastno arhitekturno prakso je ustanovil že leta 1777 in sklenil partnerstvo z lesnim trgovcem Richardom Heavsidom. Sedem let kasneje se je preselil na jug Walesa v mesto Carmathen , kjer je prejemal skromno plačo, a preizkusil poklic geodeta, gradbinca in tesarja ter dozorel kot arhitekt. Za mesto Hereford je izdelal načrt zapora. Tam je spoznal umetnostnega zgodovinarja Richarda P. Knighta, ki ga je navdušil za slikovito arhitekturo sloga Picturesque[1]. Svoj prvi načrt v slogu Picturesque je izdelal za svojo zasebno graščino East Cowel, v Walesu. Nash je zaradi članstva v deželni politični stranki Whigs in prijateljevanja s predsednikom stranke Charlesom J. Foxom, nasprotnikom kralja Georga III., vzbudil zanimanje princa Regenta (Mansbridge, 1991, str. 90). Leta 1806 je dobil mesto v upravi kraljevih nepremičnin in šele takrat, pri oseminpetdesetih letih, je postal tudi prostorski načrtovalec. Od leta 1810 naprej je Nash sprejemal le še zasebna naročila, saj se je predvsem posvetil delu za princa Regenta.

Slika 1: Regent Street iz ptičje perspektive, 2015 (vir: GoogleEarth 7.1.. (19.11.2010) London, Združeno kraljestvo. 51°30'50.90" S 0°08'10.85" Z. Bluesky 2015. http://www.earth.google.com).

Zanj prva večja urbanistična naloga, je bila prenova okrožja Westminster, ki je vodila do načrta za Regent Street. Ob podpori princa, je ustvaril širši prostorski načrt za območje, ki so ga sprejeli leta 1818. Dve leti kasneje je princ Regent postal kralj George IV. Gradnja je potekala do leta 1825, ko je bil Nash star 73 let. V letih 1813-1832 je sodeloval pri načrtovanju desetih novih cerkva v klasičnem in gotskem slogu, s pooblastilom kraljeve družine. Poleg Regent's parka je urejal park St. James, celovito je zasnoval park Crescent, trg Village East in West ter številne paviljone. Preostala njegova pomembnejša dela vključujejo: kraljevo gledališče in operna hiša Haymarket, prenova Trafalgarskega trga in rekonstrukcija vzhodnega dela Buckinghamske palače (Jeffers, 2013).

1 V nadaljevanju razlaga sloga Picturesque, na strani page 70.

Poklicno pot je končal leta 1830, ko je umrl George IV. Kralj je bil znan po ekstravaganci in del bremena javne kritike je zadeval tudi Nasha. Z njegovo smrtjo je ostal brez zaščitnika in mecena. Ob tem je kraljeva zakladnica preiskovala nedokončano prenovo Buckinghamske palače, za katero so se stroški v petih letih potrojili. Kontroverznost okoli gradnje je botrovala temu, da Nashu niso odobrili nadaljnjega financiranja kot tudi podelili plemiškega odlikovanja in drugih priznanj. Umrl je 13.5.1835 na svojem domu na gradu East Cowes (Summerson, 1980).

2. DRUŽBENO-ZGODOVINSKO OZADJE NAČRTA

London ima enega najbolj kompleksnih gradbenih razvojev v zgodovini evropskih prestolnic. Razvil se je iz rimske kolonije Londinium, današnjega City of London, ki danes ostaja drobna samoupravna enota in hkrati prvo staro mestno jedro. Drugo je področje Westminster, razraščeno okoli palače Edward's the Confessor in cerkve Church of Abby (Hall, 1997, str. 84). Tam so združene pomembne zgodovinske znamenitosti mesta in politična moč. London se je širil ob reki Temzi in cesti The Strand, ki je povezovala obe središči. Nedaleč stran, na severu, je nastal Regent Street.

Edina omembe vredna uprava v mestu je bila v City of London, ki je nasprotovala postavljanju novih neučinkovitih upravnih enot. »…Ocenjuje se , da je v Londonu vladalo nič manj kot 300 različnih upravnih teles[…] številne so imele nejasno začrtana območja oblasti, majhne prihodke in skromna pooblastila«. (Olsen 1964). Posledično je vso moč upravljanja mestnih javnih financ zasedal parlament, ki je zaradi neuravnotežene birokracije zaviral razvoj mesta ter večje odločitve prepuščal težnjam gospodarstva. »Šele leta 1855 je mesto dobilo centralno oblast pod imenom *Metropolitan Boards of Walks* in še tedaj sta bili njena moč in kredibilnost omejeni, saj so jo namesto meščanov izvolili predstavniki lokalnih oblasti in župnije.« (Arnold v: Sutcliffe, 1979, str. 76). Preobrazbe v Londonu so bile, za razliko od Pariza, zaradi pasivne vloge britanske vlade razpotegnjene po časovnem traku. Do 18. stoletja je v mestu deloval edinstven sistem najemniškega lastništva, ki je dodatno vplival na razvoj Londona. »Lastnik zemlje ni preprosto prodal, pač pa jo je posodil za določeno obdobje, navadno devetindevetdeset let. S potekom roka je lastniku pripadala vsakršna gradnja, ki je nastala v tem času. Ob takšnem sistemu in dodatnih regulacij oblikovanja prostora ter pogodb o namenski rabi, so v mestu preprečili, da bi nastajale revne četrti […] Drobna posestva, ki niso bila v lasti kralja Henrika VIII, so upravljale plemiške družine.« (Olsen, 1964, str. 84-85). Ta zemljišča so predstavljala pripraven prostor za nadaljnjo širitev Londona. Ko je prebivalstvo Londona naraščalo, je z njim naraščalo povpraševanje po bivališčih, tako so predmestne stavbe rasle navkljub prepovedi dvora. Mestni tloris Londona se je razvijal organsko in sledil topografiji, ulice so bile ozke in prenatrpane. Do leta 1800 je v londonskem metropolitanskem območju živelo nekaj več kot milijon ljudi. Petdeset let pozneje se je ta številka dvignila na 2,7 milijona in London je presegel vsa sorodna, sočasno rastoča mesta na stari celini. Proti koncu Gregorijanske dobe je industrijska revolucija Londonu prinesla razcvet srednjega in višjega družbenega sloja in ustvarila povpraševanje po razkošnih, bogato okrašenih stavbah nepremičnin, kar je služilo kot katalizator uresničevanja Nashevih ciljev.

Prvi poizkus mestnega načrtovanja v Londonu se je zgodil po Velikem požaru leta 1666, a se takrat niso odločili za širšo prenovo. Stoletje kasneje, je John Gwynn, v delu London and Westminster Improved, predlagal utreti ulico do Marylebone parka ali bodočega Regent's parka, saj naj bi ta promovirala gradnjo hiš višjega standarda (Hall, 1997, str. 85). Park je bil takrat skupaj s sosednjimi četrtmi v okrožju Westminster največja nepremičnina v lasti kraljeve družine. Ideja o prenovi tega dela mesta je tako postala znova relevantna s prihodom princa Regenta na oblast. V obdobju med leti 1811 in 1820 je bila v Londonu prisotna družbeno-prostorska razslojenost. Na severu mesta so ljudje živeli v prenatrpanih revnih četrtih. Na vzhodu Regent Street je četrt Soho, kjer so se skozi stoletja opravljale raznovrstne dejavnosti. Tam so bili nočni klubi, restavracije, gledališča, medijske hiše in javne hiše. Nasprotno je imela četrt Mayfair, na zahodu cenjena izbrana stanovanja in poslovne prostore, skupaj z galerijami, hoteli, butičnim trgovinami in ambasadami. Regent Street, ki poteka v smeri sever-jug, ti dve četrti preseka in ohrani razdelitev omenjenih dejavnosti, kar je omogočilo okrepitev aristokratskega stanovanjskega dela v četrti Mayfair (Allison, 2006, str. 118).

4. OPIS NAČRTA

Regent Street je bila pomembna komponenta širšega prostorskega načrta. Zaradi tega bomo, preden se lotimo podrobne obravnave, pojasnili ozadja štirih ključnih elementov načrta, ki krojijo ulično podobo.

4.1 Slog Picturesque

Picturesque umetnostni slog, katerega začetnik William Glipin je svoje nazore predstavil konec 18.stoletja. Slikovit ali takšen kot na sliki, kot ga prevedemo, poudarja lepoto in sublimnost. Slog je kot moderator posegel med dve takratni smernici, saj je združil elemente klasicizma in ljudske arhitekture. Zaščitniki sloga so pokrajinske motive uporabili v arhitekturnem oblikovanju. Nash se ga je poslužil v svojih načrtih za Regent's park. V njem je z uporabo mehkih krivulj uredil raznolike motive pokrajne. Tako je ustvaril idiličen počitniški okoliš znotraj mesta ter obogatil poglede nizu terasnih hiš. (Turner, 1998)

4.2 Regent's park

Park se nahaja v okrožju Westminster, s prvotnim imenom Marylebone park, na katerem je rasel nizek gozd. »Zemljišče je stoletja ostalo nedotaknjeno, ker je bila zemlja mehka in ponekod močvirnata, zaradi česar ni bilo možno kopati vodnjakov« (Brown, 2011). Okrog leta 1800 je zemlja okoli parka postajala čedalje bolj pozidana. Krajinski arhitekt John Fordyce je odkril potencial Marylebone parka, ko so 1794 objavili natečaj za prenovo gozdnatih posesti na jugu današnjega Regent›s parka, takratni severni meji Londona. Leta 1809 je Fordyce umrl in skupaj z njim je ugasnil tudi projekt. Tri leta kasneje je John Nash, takrat arhitekt zavoda za gozdove, ustvaril nov načrt, ki je bil sprejet.

»Regent's park je označen kot mejnik poskusov urejanja okolja, ki so zgrajeni na ekonomiji lastništva majhnih hiš, saj sočasno dopušča užitke bivanja v podeželski hiši in v mestu.« (Bacon, 1967, str. 202) Dela na urejanju parka

Slika 2: Načrt parka Regent, Wood, Forests and Land Revenues, 1827 (vir: https://commons.wikimedia.org/wiki/File:Plan_of_the_Regent's_Park_by_John_Cleghorn.jpg, 04.01.2015).

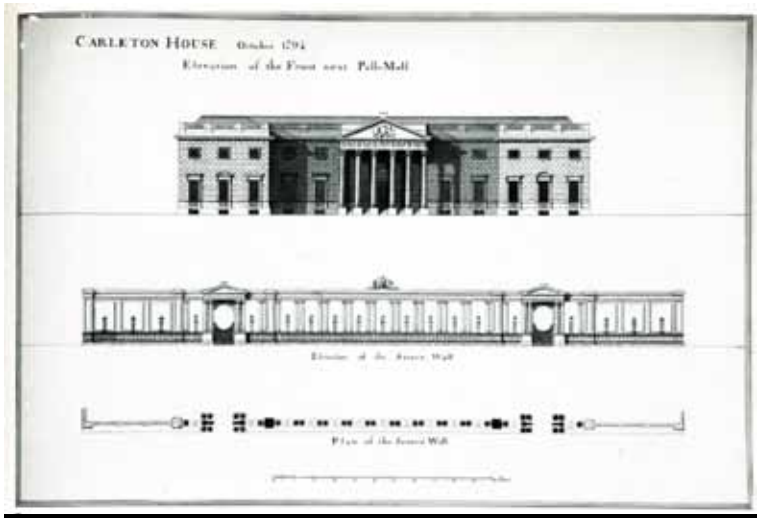
so bila prekinjena leta 1832 po smrti princa Regent. Sprva zaseben park je s časom postajal čedalje bolj odprt za javnost. Okoli parka se danes na približno treh kilometrih nizajo vrstne hiše, ki mu dajejo celosten arhitekturni izgled. Regent›s park še vedno velja za enega najbolj uglednih parkov v Londonu in po svetu.

4.3 Portland Place

Na začetku 18. stoletja je Lord Foley, britanski poslanec in član stranke Wigs, ob trgu Cavendish zgradil velik dvorec in po sredini presekal ulico Anne. Lord Foley je imel čudovit pogled proti parku na severu. Uporabil je svojo politično moč, da so v parlamentu sprejeli akt, ki je prepovedoval lastniku parka, vojvodi Portlandski, graditev kakršnega koli objekta severno od njegove hiše. V letu 1770 je arhitekt Robert Adams končeval načrte za Portland Place, takrat arhitekturno najimenitnejšo ulico v Londonu. Poteka od severnega konca Foleyjeve posesti do parka Marylebone. V načrtu za Regent Street je prestavljala njen severni odsek. Adamu je ambicije pokvaril omenjen parlamentarni akt in moral se je prilagoditi. Portland Place je razširil na dimenzije Foleyjeve hiše, zaradi česar je ulica Portland s 33 metri ena najširših v Londonu. (Todd, 2002)

4.4 Carlton house

Hiša Carlton je bila graščina, znana po lastniku princu Regentu. Je bistvenega pomena za nastanek in razvoj Regent Street, ki za hišo oblikuje veličasten dostop. Sredi 18. stoletja je bila obstoječa stavba na kraju Waterloo dotrajana in večkrat obnovljena. Zamenjala je nekaj lastnikov in končala v rokah princa Walesa. Leta 1783 jo je podaril Georgu III., ki je začel obsežno prenovo in širitev, po načrtih arhitekta Hollanda. je podedoval princ Regent, ki je nadaljeval s serijo izboljšav. Ko je bil princ 1820 okronan za kralja, se je odločil preseliti v prostornejšo Buckinghamsko palačo. Stara rezidenca se je kralju zdela staromodna in neprimerna. Motil ga je hrup neprekinjenih del, zato si je zaželel več zasebnosti. (Otago, 2013) Carltonova hiša, kot temeljna komponenta razvojnega načrta Regent Street, je bila porušena leta 1827.



Slika 3: Načrt hiše Carlton, Holland, 1794 (vir: https://austenonly.files.wordpress.com/2009/11/carlton-house10450-correction.jpg, 04.01.2015).

Hiša je imela na zunanji fasadi dve krili korintskih stebrov s pedimentom, frizom in timpanonom. Bolj zanimiv je bil interjer, pri katerem je sodeloval notranji oblikovalec kraljice Marie Antoinette, Dominique Daguerre. Drago gradnjo je tako dopolnjevala prestižna oprema prostorov. Kot je znano, je hiša hranila prefinjeno zbirko umetnin. (Hall, 1992, str. 86) Pred rušenjem, so kose notranje opreme prenesli v Buckinghamsko palačo. Na njenem mestu danes stojita po načrtih Nasha zgrajeni dve poslopji rezidence Carlton Terrace (1832) ter pred njima spomenik vojvodi Yorškem. Nash je ulico med obema poslopjema nadaljeval s širokim stopniščem do ulice Pall Mall, ki vodi naravnost do Buckinghamske palače.

4.5 Regent Street

Na začetku 19. stoletja je bil London največje in najbogatejše mesto navkljub bogastvu navzven tega ni odražalo. V gregorijanski dobi so v Londonu stavili na zadovoljitev funkcionalnih potreb in higienskih standardov. Klasičen okus je spodbujal vraščanje podrejenih individualnih hiš zidanih iz sivih opek v terasne modele. Veličastna arhitektura zasebnih hiš je bila sojena kot bahava in neprimerna za mestno okolje (Olsen, 1986, str. 12-13). London se ni mogel primerjati s palačami in javnimi zgradbami Dunaja, Pariza ali Sankt Peterburga. Oblast je na prvem mestu zagotavljala tlakovane ceste,

osvetlitev, kanalizacijo in druge sanitarne potrebe. »Namesto vodometov so gradili vodovode za vsako gospodinjstvo« (Bacon, 1967, str. 201). Posledično je bil London videti manj bogat kot je bil v resnici. Interes se je, navkljub povečanem povpraševanju po stanovanjskih nepremičninah, preusmeril v prenovo in gradnjo hiš na podeželju, zaradi česar je ostalo manj denarja za gradnjo sredi Londona. Šele takrat, ko je princ Regent postal član kraljeve družine, je ta lahko prepričal parlament k prenovi Carltonove hiše in Buckinghamske palače. (Olsen, 1986, str. 15).

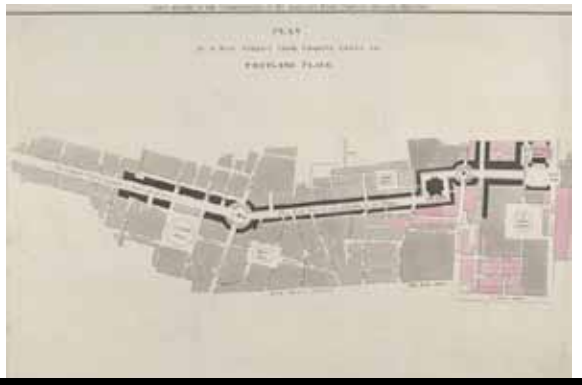
Bodoči kralj George IV. je nameraval zasenčiti Napoleonovo ulico Rue de Rivoli v Parizu. Želel si je monumentalni dostop do svoje letne rezidence hiše Carlton, ki bi navdušila obiskovalce kraljevega dvora, kot tudi neposredne povezave s Regent's parkom. Nash je princa že poznal. Zanj je od 1809 delal prve načrte, a se je v zgodbo projekta vmešal šele leta 1813, ko je bil nameščen na mesto generalnega upravitelja kraljevih posesti. Projekt so spremenili v bolj odprto prenovo, ki bi razbremenila sosednje ulice prometa. Londončanom bi omogočila enostavnejši dostop do parlamenta, sodišča in drugih javni služb. Četrti bi očistili in pregnali berače, cene nepremičnin bi se dvignile, hkrati bi izkazovala intelektualno in vojaško moč naroda. (Arnold, 2005, str. 91) Istega leta je bil sprejet predlog zakona, ki je potrdil princevo vprašljivo investicijo. Dela na ulici so se začela leta 1814. Gradnja je zahteva rušitev motečih zgradb in postavitev novih elegantnih terasnih stanovanjskih hiš ob ulici in v sosednjih četrtih. Zgrajen je bil trinajst kilometrov dolg kanal (1816), ki povezuje zahodni London z reko Temzo na vzhodu ter 166 hektarov velik Regent›s park (1835). Obnovljen je bil park St.James (1827), kot tudi javne zgradbe sosednjih četrti Mayfair in Soho.

Odobritev razvojnega načrta parka Marylebone in Regent Street s strani kraljeve blagajne je naznanila kratko obdobje obsežnih projektov urbane prenove Londona. Zaradi priseljevanja, deflacije in nižanja cen gradbenih materialov po Napoleonovih vojnah se je gradnja v Londonu razcvetela. Številne današnje vedute mesta zato izhajajo iz časov vladavine Georga IV. Optimizem zmage pri Waterlooju je ugasnil leta 1825 na valu finančne krize. Usihanje kapitala je onemogočilo špekulativne naložbe, s katerimi se je zgradil *Regent Street*. Zadnje stavbe ob ulici so bile zato dokončane šele leta 1901 (Olsen, 1986, str. 21).

4.6 Podroben opis

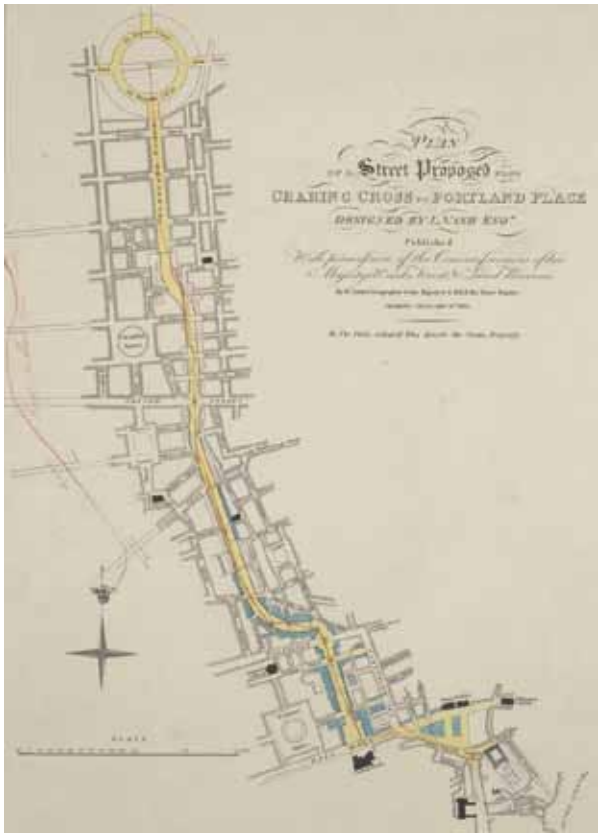
Iz prvotnega načrta leta 1812 je razvidno, da se bulvar Portland Place z zamikom podaljša in nato utre ravno pot do ulice Oxford. Ob preseku z njo se pojavi krožni trg Oxford Circus. Ulica se nadaljuje mimo trgov Hanover in Golden proti jugovzhodu, kjer se začnejo kolonade. Za ta del so bile načrtovane izložbene trgovine.

Ravnina se je končala v kotu kvadratnega trga, kjer bi sredi stala javna zgradba (slika 4). Nadaljuje se diagonalno do križišča Piccadilly circus, zgrajenega leta 1819, kjer jo preseka cesta Piccadily. V enaki smeri ulica nadaljuje in konča pri hiši Carlton. Četrt kilometra proti vzhodu je postavljen Charing Cross, danes je znan kot trg Trafalgar, kjer se mestu tradicionalno pripisuje središče. Leta 1820 ga je prenovil John Nash. (Bacon, 1967, str. 201). Regent Street je umeščena v stari del mesta, nedaleč stran od kraljevih palač.



Slika 4: Zavrnjen načrt, John Nash, 1812. Roza prikazuje nedavno pridobljene kraljeve posesti (vir: http://images-1.georeferencer.com/images/iiif/333542510582/full/,300/0/native.jpg, 04.01.2015) © The British Library Board.

Leta 1814 je bil odobren spremenjen načrt za izgradnjo Regent Street. »Naloga je bila kompleksna, a pomembno je bilo, da si je kraljeva zemljiška družba lastila več kot polovico relevantnih zemljišč.« (Hall, 1992, str. 86)



Slika 5: sprejet načrt, John Nash, 1814. Modra barva ponazarja kraljeve nepremičnine (vir: http://ogi-images.bl.uk/images/007/007ZZZ000000012U00017000[SVC2].jpg, 04.01.2015) © The British Library Board.

»…porušeno je bilo skupno 741 hiš, zgolj 386 jih je pripadalo kraljevi družbi Crown, in še ta so bila združena na južnem delu ulice.« (Arnold, 2005, str. 84)

Nad križiščem Picadilly, se je Nash soočil z zamikom osi hiše Carlton in severne ulice Portland. Da bi poskrbel za zamik osi južnega dela Regent Street, si je Nash prvotno zamislil trg v obliki kvadrata, ki bi ga ulica napajala na nasprotnih stranicah, kar se je to izkazalo kot predrag podvig. Raje kot diagonale, se je poslužil krožnega izseka (kvadranta). »V tem delu je trg opusti in nova ulica na vrhu križišča Piccadilly je zarisala širši zavoj okoli nekaterih zemljišč, čigar nakup se je izkazal kot predrag.« (Hall, 1992, str. 86). Centralni prostor Kvadrant (slika 6), je bil tisti element, ki je Regent Street naredil prepoznavno. Lok je ulici dodal arhitekturno identiteto, ki jo je nujno potrebovala »Nash je razvil lunasto obliko zavoja in na obeh straneh stavbe obogatil s prepoznavnim stebrnim redom. Ta zaviti odsek je financiral sam, saj takrat v ta del projekta ni verjel nihče.« (Hall, 1992, str. 86)

Kvadrant, kot je bil zgrajen, je imel pokrito sprehajalno pot ob izložbah. Kolonadi dorskih stebrov nista bili po volji lastnikov trgovin. Pritoževali so se zaradi pomanjkanja sončne svetlobe. Imeli so težave s kriminalom. V senci, so se med stebri zadrževale skupine prostitutk. Po peticiji, ki so jo podpisali lastniki, so stebrišči označili kot konstrukcijsko nestabilni. Porušili so ju leta 1848. (Partleton, 1865)

4.7 Ovire

Nash ni uporabljal vnaprej ustvarjenih shem prostorskega snovanja. Obliko ulice je prilagodil funkcionalnim zahtevam mesta na način, da se je oviri ognil, ali pa je sam posredoval v arhitekturni postavitvi in tako dosegel želeno strukturo. Poseben trn v peti so bile nedavno končane gradnje. Poleg načrtovalca je osebno prevzel vlogo posrednika prodaje mnogih zemljišč, kar je pripomoglo k uresničevanju njegovih načrtov. Navkljub arhitektovemu prizadevanju, je med gradnjo prišlo do odstopanj od načrta. »V projekt se je tako zatopil, da je bil nezadovoljen s samim oblikovanjem državnega načrta, kar ga je gnalo k investiranju lastnega denarja v gradnjo tistih delov načrta, ki jih nihče drug ni želel gradit.« (Bacon, 1967, str. 211)

Ker bi bila sočasna gradnja na projektu takšnega merila prezahtevna, so ulico razdelili na manjše, obvladljive parcele. Gradnja je bila postopna, deloma zasebno financirana in počasnejša. Sredstva za kanalizacijo, tlakovanje ceste in pločnikov so bila zagotovljena iz javne blagajne, a največ denarja so namenili pridobivanju nujnih zemljišč. (Arnold, 2005, str. 84)

Slika 6: kvadrant, J. Woods, gravura (vir:https://en.wikipedia.org/wiki/File:Quadrant,_Regent_Street_engraved_by_J.Woods_after_J.Salmon_publ_1837_edited.jpg, 25.07.2015).

Ena izmed težav, ki so pestile projekt, je bila zagotovo ta, da je bil večji deli starega tkiva nedavno obnovljen. Nash je moral os je premakniti bolj vzhodno, kot bi si sam želel. Tako se je izognil zadnjim hišam na trgu Cavendish na južnem delu obstoječega Portland Place. (Allison, 2008, str. 172) Zaradi nepremičninskega posla, ki ga je Nash sklenil s politikom Jamesom Langhamom, je bil zamik je bil narejen ostreje, kot je bilo načrtovano. Ker je kupil del Foleyjeve posesti na koncu bulvarja Portland, je Nash lahko zamaknil ulico v komolčni člen in s tem odprl veduto. Oblasti je prepričal, da zgradijo na kraju Langham cerkev All Souls in Nasha imenujejo za arhitekta. (Bacon, 1967, str. 206) Ulica ob njej odrezano zaniha na zahod, da se poravna z ulico Portland. Cerkev je edino ohranjeno Nashevo delo na Regent Street.

Odstopanja od načrta so od kraljeve blagajne zahtevala nove finančne prilive. »Celotna gradnja ulice se je zaradi nepredvidenih stroškov skoraj potrojila, iz £600,000 na £1,709,042.« (Arnold, 1999, str. 105).

4.8 Arhitektura ob Regent Street

Nash je imel pri oblikovanju stavb pomoč mladih arhitektov, kot sta bila James Pennethorne in Decimus Burton. Z njima je tesno sodeloval, da so skupaj dosegli koherentno strukturo vzdolž celotne ulice. Prakticirali so britansko šolo neoklasicistične arhitekture, iz katere so razvili stil Regency. Ta je prostoru dajal lahkotnost in eleganco. Posebno pozornost so posvečali notranji opremi, tapetam in poslikavam, katere se je prijelo ime *Regency style*. V slogu antične Grčije so si sposodili stebrne rede, trikotne pedimente ter preproste oboke. Klasična tipologija je bila vrstna hiša svetlih barv s tremi nadstropji in enostavnimi razmerji. Uporabili so visoka, ozka, pogosto ovalno zaključena okna, ki so segala do tal.

Nash je izrabil vse prednosti tehnike štukature, s katero je krasil na cenovno ugoden način. Štukatura se je pojavila v času Rokokoja, ko je v Londonu ar-

Slika 7: All Souls Church, Langham Place (vir: https://en.wikipedia.org/wiki/File:All_Souls_Church_Langham_Place.jpg, 25.07.2015).

hitektura potonila na najnižjo raven, vse vrste dekoracij so izginile in pustile osiromašena pusta bivališča. Za arhitekte Londona, ki nisi imel kamnolomov na dosegu, je ta tehnika nudila priložnost izboljšave gradnje iz cenenih opek z dekorativnimi elementi. Za simboličen strošek so še najbolj navadnemu bivališču lahko simulirali rustikalnost, vsaj na pritličnem uličnem nivoju. Graditelji so lažje uresničevali stebrišča, timpanone, skulpture in abstraktne plitve reliefe. Vendar se je ta metoda dela nekaterim zdela umetna. »Lažni kamni, lažni stebri, lažni kapiteli in lažni venci ulice in Regent's parka so za množico ustvarili varljiv občutek izbirčnega in premišljenega okusa, ampak so v kultiviranem opazovalcu lahko ustvarili le občutek gnusa.« (Statham v: Bacon, 1967, str. 206).

Zgrajene stavbe so bile med leti 1895 in 1927 v izvedbi prikrajšane za številne elemente, poleg tega je bila skozi čas večina stavbe, ki si jih je Nash sam zamislil, porušenih ali zamenjanih z masivnejšo, bolj grobo arhitekturo. Kljub temu med njimi ostaja pomembna praznina, ki ohranja vidno dinamiko ulične scene in arhitektovo vizijo.

5. POMEN NAČRTA ZA LONDON IN RAZVOJ URBANIZMA

Nash je v središču prestolnice Anglije in Velike Britanije ustvaril ulico neprecenljivega pomena, ki je danes hrbtenica mestne infrastrukture. Predstavil je inovativne pristope celovitega, čeprav aristokratsko naravnanega urbanega oblikovanja in dokazal, da urbanizem ni zgolj praksa združevanja individualnih arhitekturnih objektov. Projekt odlikuje integrirana prostorska vizija kot produkt simbioze arhitekture in urbanizma. Nastajal je več kot petdeset let prej, kot sta se Napoleon III. in baron Haussmann lotila slovite prenove Pariza. Tako je Nash eden izmed pionirjev, ki so odločno utrli nove povezave v obstoječe mestno tkivo. Razsežnost rekonstrukcije tega dela Londona je razvidna iz analitičnega prikaza (slika 9).

Od konca gradbenih del do danes je ob Regent Street cvetela trgovina. Na skoraj dveh kilometrih je zaposlenih več kot 10.000 ljudi in vsako leto jo obišče več kot 7,5 milijona turistov (Crown Estate, 2015). Mestu služi kot prometna arterija, nakupovalno središče, poslovna cona, območje centralnih dejavnosti. Tedenski višek tranzita, na določenih točkah, lahko v eni uri pomeni od 13 do 29 tisoč pešcev (London Assembly, 2010, str. 13). Projekt

Slika 5: sprejet načrt, John Nash, 1814. Modra barva ponazarja kraljeve nepremičnine (vir: http://3.bp.blogspot.com/-8drgplYfsb4/TeiJy320XyI/AAAAAAAADK8/9oFgDX5AjGQ/s1600/Piccadilly+circus+1950s.jpg, 04.01.2015) .

je bil v ekonomskem pogledu uspešen že takoj po izgradnji. Študija narejena deset let kasneje, je ugotovila, da so se prodajne cene okoliških objektov v splošnem dvignile, cene najemnin na sami ulici pa so se dvignile za tretjino. (Arnold, 1999, str. 105) Vsi ti statistični podatki pričajo o pomembnosti ulice in finančni uspešnosti projekta. Danes je Regent Street po svetu znana kot ena pomembnejših prestižnih nakupovalnih ulic.

Estetske karakteristike ulice so bile velikokrat posledica kompromisov. Razni zavoji, zamiki, presledki in širitve so ji dodale pestrost in raznovrstnost, a se je od nastanka bistveno spremenila. Velika večino zgradb so porušili in obnovili z različnimi odnosi do varovanja arhitekturne dediščine. Najbolj očitno spremembo in komercializacijo je moč opaziti na južnem delu, na mestu Piccadilly Circus (slika 9). Ta je danes po vzoru New Yorškega Broadwaya prekrita s svetlečimi reklamnimi napisi. Prve so namestili že na začetku 20.stoletja.

Slika 9: Tloris Regent Street; (1.- Regent's park, 2.- park St. James, 3.- današnji mestni kare, 4.- predhodno stanje leta 1806 (rumena), 5.- Portland place, 6.- hiša Carlton). (vir: avtorska risba).

Na Regent Street je Nash povezal črepinje in ustvaril skupen prostor za novo in staro arhitekturo. Od tod izhajajo novosti sloga picturesque, sub--urbane vile ob Regent's parku, členjene fasade in mešanje stilov hibridne ulične zazidave. Ampak tisto, kar je načrt za Regent Street naredilo za enega najpomembnejših urbanističnih načrtov 19. stoletja, je bila vpeljava Kvadranta, kjer je Nash v tlorisu razvil markantno lunino obliko in s tem ulici dodal obraz.

6. ZAKLJUČEK

Preoblikovanje pomembnega dela Londona okoli Regent Street vidimo kot obsežno in zahtevno nalogo, ki je terjala premišljenega, zbranega in predvsem angažiranega projektanta, za kakršnega se je John Nash vsekakor izkazal. V svojem času je načrt izpolnil vsa pričakovanja. Upošteval je prometno pretočnost, higienske standarde in standarde požarne varnosti ter berljivost mestne pokrajine. Zadovoljil je apetite princa Regenta ter hkrati večkrat povrnil lastno ceno, zaradi česar projekt ocenjujemo kot uspešen. Soustvarjal je arhitekturni slog svojega časa, ker je ulico oblikoval kot ne--uniformirano zavito os in uporabil za tisti čas inovativno strategijo utiranja ulic v obstoječo stavbno morfologijo. Preko prijateljevanja s princem Regentom je znatno prispeval k razvoju stila Regency.

Ulica ima vsekakor tudi drugo, manj svetlo plat zgodbe. Grajena je bila z javnim denarjem, a načrtovana z namenom vzdrževati stanje socialne segregacije v prostoru. Projektanti so želeli zaščititi četrt Marylebone pred prihodi revežev iz vzhoda in z Regent Street vzpostaviti prostorsko zaporo. (Arnold, 2005, str. 84)

Čeprav Regent Street ni bila zasnovana samo za motorni promet, imajo vozila prednost. Vožnja s kolesom je zaradi pomanjkanja kolesarskih poti in gostega motornega prometa, milo rečeno, nepriporočljiva. Onesnaženost zraka zardi gostega motornega prometa je velika. Rekordna raven NO2, izmerjena na merilni postaji ulice Oxford, je dosegla kar 463 µg/m3, kar je11 krat več, kot dovoljuje uzakonjena meja. (Morales, 2014) Tudi meritve trdnih delcev niso spodbudne. Mestne oblasti se trudijo izboljšati pogoje. Načrtovani so ukrepi spreminjanja avtobusnih poti, izboljšanje kolesarske infrastrukture, racionalizacija dostavnih vozil in vpeljava con mešanega prometa. (London Aseembly transport committee, 2010, str. 31) Do sedaj so prenovili vozni park mestnih avtobusov na standard Euro5 ter uredili sistem lincenc za čistejše taksije.

»*…Pustil bom bralcu, da se spomni zmešnjave nagnete mase nesrečnih ulic in hiš, ki so pred dvajsetimi leti prekrivale prostor Regent Street. Zdaj poglejte to sijajno pridobitev Londona, in Regent›s park, zdaj je eden najbolj vitalnih in živahnih javnih prizorišč…*« (Hook v:Brown, 2011) Tako je leta 1825 projekt komentiral Theodor Hook, urednik tedanjega časopisa John Bull. Danes bi si res želeli tudi boljših kolesarskih poti, mešanih dejavnosti, morda tudi več zelenja. Vendar je za tisti čas Nashov načrt najmanj presegel minimalne zahteve in zagotovil pogoje za dolgoročni razvoj tega dela mesta.

Slika 10: Regent Street na dan kraljeve poroke, 2011, fotografija (vir: https://pixabay.com/en/regent--street-london-regent-uk-664485/, 04.01.2015).

Slika 11: Pogled na Kvadrant, Ciaran Kenny, 2011. fotografija (vir: https://pixabay.com/en/london--regent-street-england-street-526246/ 04.01.2015).

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Andrej Mahovič: TIPOLOGIJA PREMIČNIH STREŠNIH KONSTRUKCIJ STADIONOV IN ŠPORTNIH DVORAN

TYPOLOGY OF RETRACTABLE ROOF STRUCTURES IN STADIUMS AND SPORTS HALLS

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IZVLEČEK

Premične strešne konstrukcije so eden izmed štirih osnovnih sistemov (poleg prireditvene površine, tribun in ovoja) stadiona in športne dvorane. Streha varuje uporabnike stavbe pred različnimi vremenskimi vplivi in ustvarja optimalne pogoje za izvajanje različnih dejavnosti. Stadioni in športne dvorane s premično strešno konstrukcijo povečujejo število dejavnosti, ki se lahko v stavbi izvajajo, izboljšujejo kakovost izvajanja in spremljanja različnih dogodkov ter vplivajo na občutenje in doživetje ljudi ob uporabi ali opazovanju takšne stavbe. Premična strešna konstrukcija omogoča naravno osvetlitev in prezračevanje prireditvenega prostora, omogoča ustvarjanje optimalnih pogojev za rast trave na prireditveni površini, zmanjšuje stroške uporabe in vzdrževanja stavbe. Različne tipologije premika strešnih konstrukcij (frekvenca odpiranja in zapiranja, zasnova konstrukcije, načini premika) so kategorizirane glede na njihovo arhitekturno in konstrukcijsko zasnovo. Uporaba različnih premičnih sistemov streh v svetu je pokazatelj njihove učinkovitosti in smotrnosti ter izhodišče za uporabo premika tudi pri drugih osnovnih sistemih stadionov in športnih dvoran. Raziskovanje in načrtovanje lastnosti premičnih strešnih konstrukcij vodi v zasnovo novih premičnih sistemov, ki lahko z uporabo načela premika spremenijo namen premičnih elementov ali prevzemajo lastnosti drugih osnovnih sistemov.

KLJUČNE BESEDE

stadion, športna dvorana, premična strešna konstrukcija, tipologija premičnih streh

ABSTRACT

Retractable roof structures are one of the four fundamental systems (in addition to the playing area, stands and facade) in a stadium and sports hall. The roof protects users against various weather conditions and creates optimum circumstances for carrying out different activities. Stadiums and sports halls with retractable roof structures can host a greater variety of activities, improve the quality of their implementation and the quality of visitors' experience, and affect the perception and experience of people using or observing such buildings. A retractable roof structure allows for natural lighting and ventilation of the venue, gives optimal conditions for grass growth on the playing field, and reduces costs of use and maintenance of the building. Different typologies of movement of roof structures (frequency of opening and closing, design of the structure, and methods of movement) are categorised in terms of their architectural and structural design. Application of different retractable roof systems worldwide is indicator of their effectiveness and efficiency, and is basis for use of movement also in other fundamental systems of stadiums and sports halls. Research and identification of characteristics of retractable roof structures lead to the design of new moving systems that can with the application of the moving principle change the purpose of movable elements or assume the characteristics of other fundamental systems.

KEY-WORDS

stadium, sports hall, retractable roof structure, typology of retractable roofs

1. INTRODUCTION

Origins of the development of retractable roof structures can be traced back to ancient times when Romans covered their buildings intended for mass events (amphitheatre, theatre, and circus) with foldable awnings. They used simple retractable systems (wooden beams, ropes, canvas) for unfolding the roof above stands and thereby protecting users from a variety of weather conditions.

Today, retractable roof structures are used in stadiums and sports halls to allow the implementation of various activities inside the building regardless of weather conditions, to allow a multipurpose use of the playing area, to provide natural conditions for grass growth in the pitch inside the building, to enable natural lighting and ventilation of the venue, and to provoke different perceptions and experiences of people using or observing such buildings.

Structural design and technology of movement in modern retractable roof structures are based on the application of structural systems of movement and their components, which were initially used in the movement of ships during their construction in shipyards, as well as in the transhipment of containers in ports, and in oil drilling rigs, the common characteristics of which were heavy weight and large dimensions of the movable elements.

The increasing number of planned and built stadiums and sports halls with retractable roof structures has led to the definition of fundamental principles and rules for their design. Rotation, sliding, folding, lifting and lowering of the roof of a stadium and sports hall have given new possibilities for use of the building. Rigid roof structures and roof membranes, weighting a few hundreds of tones, are moved or folded within minutes through various mechanisms, transforming the building from a closed into an open roof and vice versa.

Movement of the roof structure significantly influences the structure of space inside the building, the architectural and structural design and expression of the building, user safety, and other engineering properties of the building. Introduction of retractable roof structures in stadiums and sports halls undermines the specific attributes of each building type, making them become similar in terms of design and size.

Development and application of retractable roof structures define the basic intent and purpose of movement. Characteristics of the retractable building type define the basis for application, which could lead to the upgrading of the basic purpose of movement. In doing so, we are interested in: the typology of retractable roof structures of stadiums and sports halls in relation to frequency of movement, conceptual design of movable element and type of movement; possible combinations of different types of movement to achieve multipurpose use of a retractable roof structure; types of movement of other fundamental systems of stadiums and sports halls.

By using different types of movement, retractable roof structure may take on the characteristics and functions of other fundamental systems (playing area, stands, and facade) of a stadium and sports hall.

2. DEFINITION OF RETRACTABLE ROOF STRUCTURES

Retractable roof structures in stadiums and sports halls can be defined as follows: "Retractable roof structures are a type of roof structure, which can be completely or partly moved or folded in a short period of time so that the building can be used with an open or closed roof" (Ishii, K., 2000).

The process of opening and closing of the roof structure can be executed when the building is not in use or simultaneously with an activity taking place. In either case, safety of all building users is of paramount concern.

2.1 Typology of retractable roof structures based on frequency of opening and closing

One of the important factors to take into account when designing retractable roof structures of stadiums and sports halls is the frequency of opening and closing of the roof structure. During the design of the building, the anticipated frequency of opening and closing determines the design of the structure, type of movement, size of movable roof elements, and type of moving system.

Design, construction, use and maintenance have influenced the formation of different types of retractable roof structures that vary in the frequency or repetition of opening and closing. Types of retractable roof structures based on frequency are:

Retractable roof structures that are opened or closed twice a year, that is in summer and winter period (frequency depending on the season) (Figure 1). Design of this type of retractable roof structure is used in buildings that are closed during the transition from summer to winter and vice versa.

Frequency depending on the season

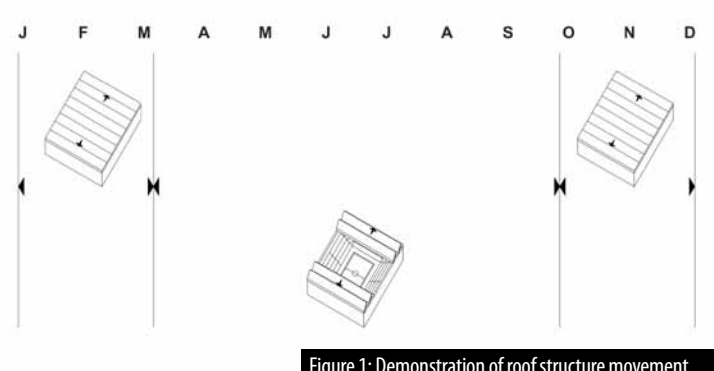


Figure 1: Demonstration of roof structure movement depending on the season (annual opening and closing).

Example: Swimming Pool Boulevard Carnot, Paris, France (1967); roof structure design: membrane; movement frequency: twice a year; type of movement: folding (Figure 2).

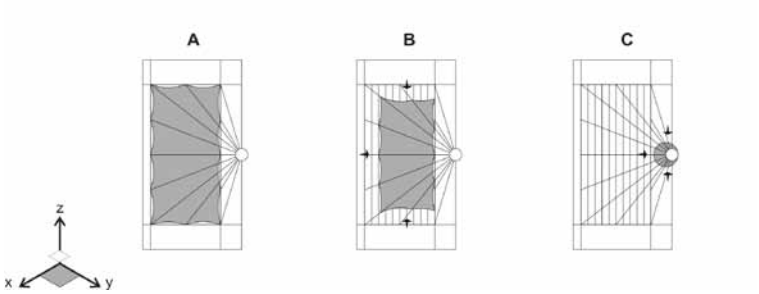


Figure 2: Demonstration of opening and closing of roof structure by seasonal frequency (A - closed, B - half-open, C - open) in Swimming Pool Boulevard Carnot.

Retractable roof structures that are primarily closed and are opened occasionally or when there are special requirements (frequency closed - open) (Figure 3). This type of retractable roof structure design is mainly used in smaller buildings (sports halls) intended for indoor events, where the open roof is used only occasionally (e.g. favourable weather conditions that do not affect the implementation of activities). This opening method is also used for the relief of the roof structure in the event of large quantities of snow, which slide off the roof during its movement. If the building's playing area is made of natural grass, the open roof is used to provide optimal conditions for grass growth.

Frequency closed - open

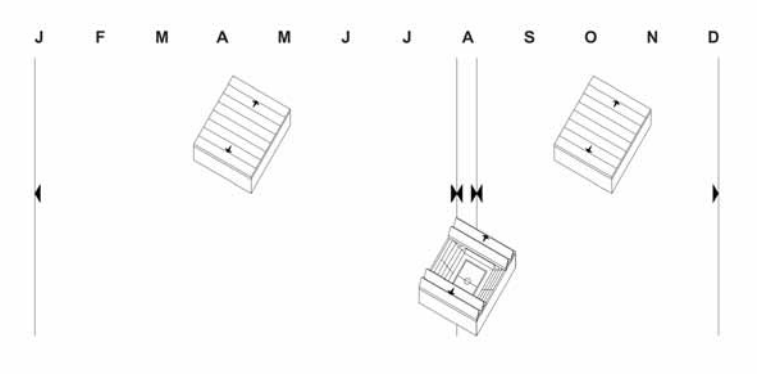


Figure 3: Demonstration of roof structure movement in buildings with primarily closed roofs that are opened only in special cases (annual opening and closing).

Example: Ball Dome sports hall, Fuchumachi Hayahoshi, Japan (1991); roof structure design: rigid; movement frequency: in case of favourable weather conditions; type of movement: sliding, rotation (Figure 4).

Retractable roof structures that are primarily open and are closed if necessary (frequency open - closed) (Figure 5). This type is used for larger buildings (stadiums) that host open-air events and use the retractable roof structure only a few times a year in case of adverse weather conditions. The roof is closed in case of rain, wind, heat or cold.

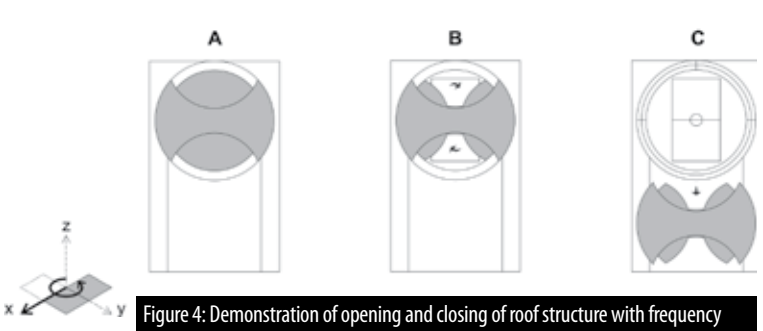


Figure 4: Demonstration of opening and closing of roof structure with frequency closed - open (A - closed, B - half-open, C - open) in Ball Dome Sports Hall.

Frequency open - closed

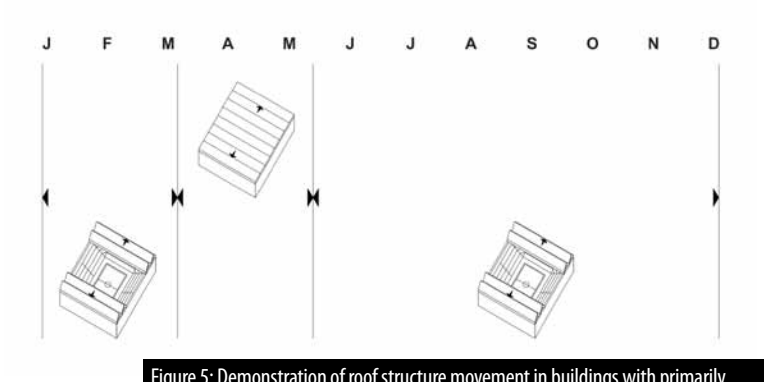


Figure 5: Demonstration of roof structure movement in buildings with primarily open roofs that are closed in special cases (annual opening and closing).

Example: Tennis stadium Waldstadion, Frankfurt, Germany (2005); roof structure design: membrane; movement frequency: depending on weather conditions; type of movement: folding (Figure 6).

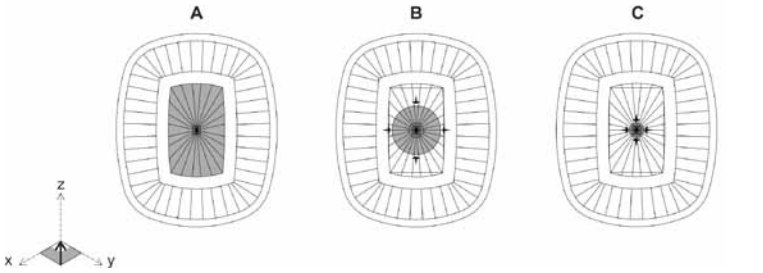


Figure 6: Demonstration of opening and closing of roof structure with frequency open - closed (A - closed, B -half-open, C - open) in Tennis stadium Waldstadion.

Retractable roof structures that are regularly opened and closed (frequency of repetition) (Figure 7). The roof is opened and closed monthly, weekly, daily or several times a day, even with activities taking place. Thus, building users can observe how the roof structure or parts of the structure

are closing and opening. Roof structure movement is creating different atmospheres and different conditions for carrying out various activities. The possibility of constant opening and closing allows the building to adapt to changing weather conditions.

Frequency of repetition

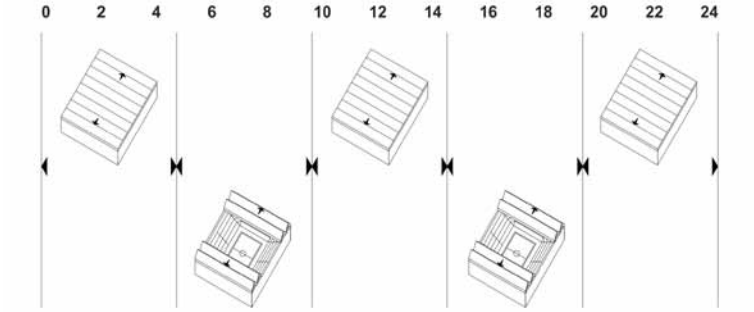


Figure 7: Demonstration of roof structure movement in buildings with regularly opening and closing roofs (daily opening and closing).

Example: Tennis stadium Qizhong Forest Sports City Arena, Shanghai, China (2003); roof structure design: rigid; movement frequency: constantly, also during events; type of movement: sliding (Figure 8).

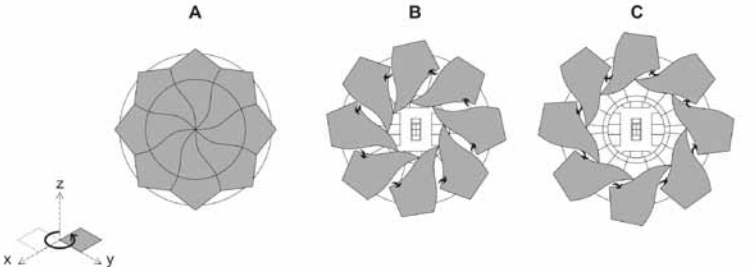


Figure 8: Tennis stadium Qizhong Forest Sports City Arena; demonstration of opening and closing of roof structure with frequency of repetition (A - closed, B - half-open, C - open).

2.2 Typology of retractable roof structures based on structural design

Stadiums and sports halls with retractable roof structures have different structural designs of movable and fixed roof elements. Structures are made of different materials, which vary according to the size of the movable element (range), weight of the movable element, frequency of opening and closing of the movable structure, duration of the move, type of movement of the roof structure, and additional load (high winds, high snow).

Based on the structural design of their movable and fixed elements, retractable roofs in stadium and sports halls can be divided into three types:

- retractable roof structures composed of rigid elements (Figure 9, A);
- retractable roof structures composed of membranes (Figure 9, B);
- retractable roof structures as combination of different elements (rigid elements and membranes) (Figure 9, c).

Structure design of retractable roof elements

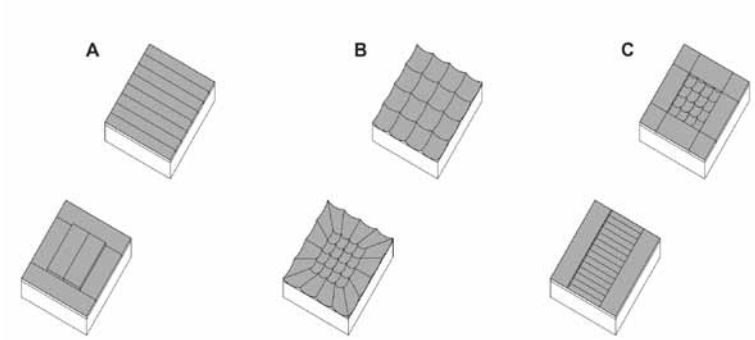


Figure 9: A. Retractable roof structures composed of rigid elements; B. Retractable roof structures composed of membranes; C. Retractable roof structures composed of a combination of rigid elements and membranes.

Retractable roof structures composed of rigid elements. The entire roof or individual smaller parts of the retractable roof are composed of rigid elements that are moving in various ways. Example: Wembley Football Stadium, London, UK (2007); structure design of fixed and movable roof elements: rigid; type of movement: sliding (Figure 10).

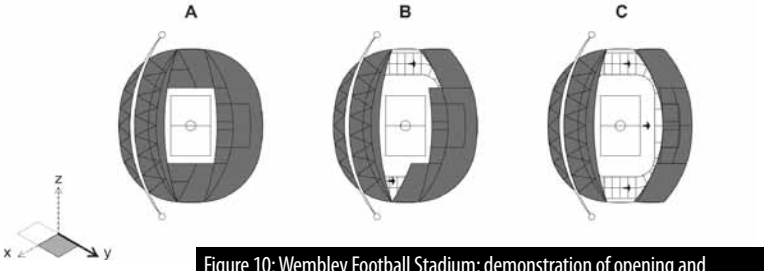


Figure 10: Wembley Football Stadium; demonstration of opening and closing a rigid roof structure (A - closed, B - half-open, C - open).

Retractable roof structures composed of membranes. The entire roof or individual smaller parts of the retractable roof are membranes that are moving in various ways. Example: Tennis Stadium Rothenbaum, Hamburg, Germany (1997); structure design of fixed and movable roof elements: membrane; type of movement: folding (Figure 11).

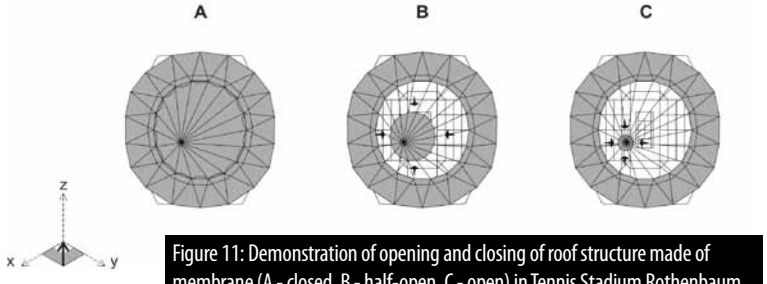


Figure 11: Demonstration of opening and closing of roof structure made of membrane (A - closed, B - half-open, C - open) in Tennis Stadium Rothenbaum.

Retractable roof structures as combination of different structure designs. Entire roof or individual smaller parts of the retractable roof are composed of different elements that are moving in various ways. Example: The Big "O" Olympic Stadium, Montreal, Canada (1976); structure design of fixed and movable roof elements: rigid, membrane; type of movement: folding (Figure 12).

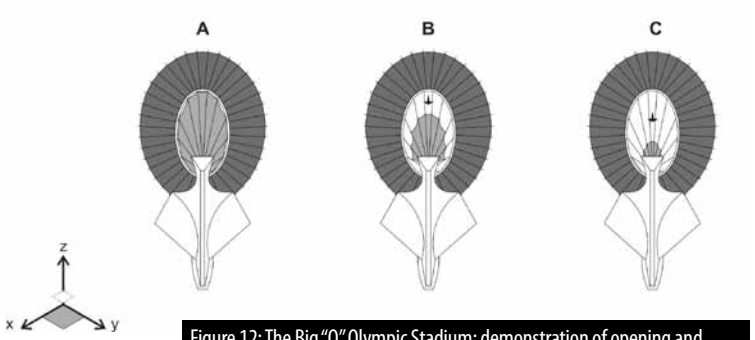


Figure 12: The Big "O" Olympic Stadium; demonstration of opening and closing of roof structure composed of different elements (rigid, membrane) (A - closed, B - half-open, C - open).

2.3 Typology of retractable roof structures based on type of movement

The selection of a retractable roof structure with a specific type of movement during design and realisation of stadiums and sports halls depends on the following: purpose of the retractable roof structure; duration of roof structure movement; frequency (repetition) of open and/or closed roof structure; building size and size of movable elements.

Based on the type of movement, different types of retractable roof structures can be identified:

- roof structures with sliding system;
- roof structures with lifting system;
- roof structures with rotating system;
- roof structures with folding system;
- roof structures with expendable system;
- roof structures with combined system.

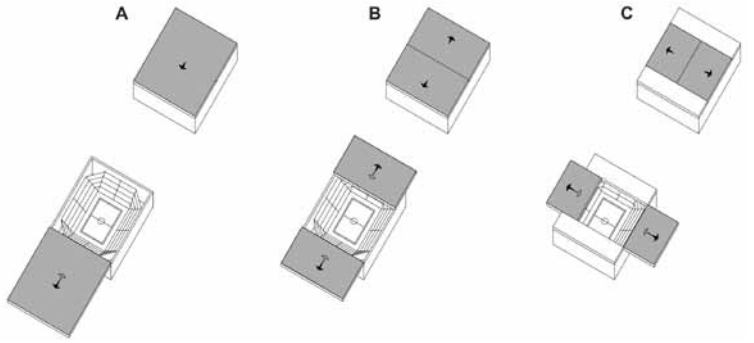
Roof structures with sliding system

Definition of the sliding system: A roof structure with sliding system is moved by sliding in the horizontal direction (Figure 13).

Design of roof structures with sliding system

Examples: Ariake Colosseum Hall, also known as Ariake Tennis Forest Park, Japan (1987), represents a building with a rigid retractable roof structure. The entire roof structure is composed of two elements and moves by sliding in the longitudinal direction, transforming the building's structure from closed to open roof and vice versa. The roof is composed of steel truss

Figure 13: A. Sliding of the entire roof structure; B. Sliding of individual parts of the roof structure (movement in the longitudinal direction of the building); C. Sliding of smaller parts of the roof structure (movement in the transverse direction of the building).



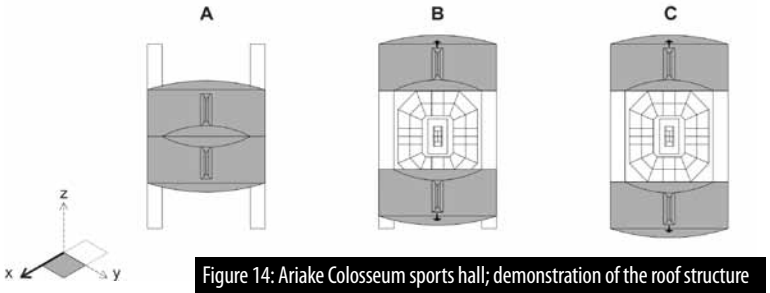


Figure 14: Ariake Colosseum sports hall; demonstration of the roof structure sliding in the longitudinal direction (A - closed, B - half-open, C - open).

and the load bearing steel pillars, and moves (slides) on rails by means of electric motors. By retracting the roof the entire floor area of the building opens (Figure 14).

Another example of the horizontal movement of a rigid roof structure is Amsterdam Arena, Netherlands (1996). The roof of the covered stadium is composed of one fixed and two movable elements, which are moved horizontally in the transverse direction of the building. Steel lattice of the movable roof structure slides along two main transverse beams by means of wheels and electric motors. With movement of the roof elements the entire playing field opens up, while stands remain under the fixed part of the roof (Figure 15).

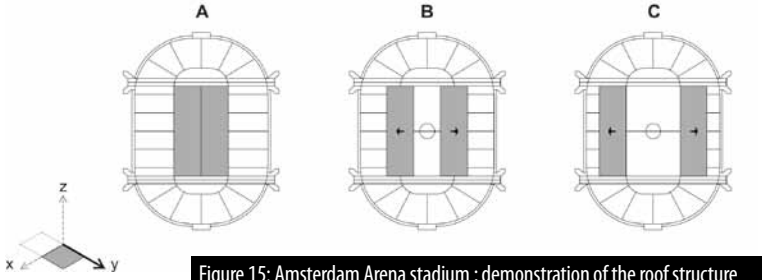
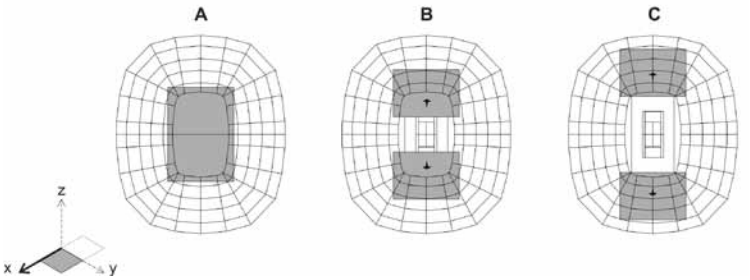


Figure 15: Amsterdam Arena stadium ; demonstration of the roof structure sliding in the transverse direction (A - closed, B - half-open, C - open).

The third example illustrates the sliding system in a membrane roof. Gerry Weber Tennis Stadium, Germany (1994) is realised with a fixed and movable roof structure (Picture 14). The movable element is made of two parts which cover up the playing area. The lightweight construction slides along cradles by means of a winding system placed beneath the level of the fixed roof, changing the building's structure from closed to open roof and vice versa. The roof structure is characterised by lightness, simple control, and transparency that allows light coming into the building even with a closed roof (Figure 16).

Figure 16: Gerry Weber Tennis Stadium; demonstration of roof structure with sliding system (A - closed, B - half-open, C - open).



Roof structures with lifting system

Definition of lifting system: Roof structure with lifting system is lifted and lowered to a desired height (Figure 17).

Design of roof structures with lifting system

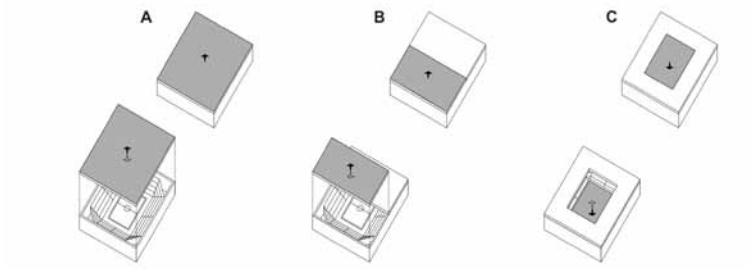


Figure 17: A. Lifting system opening entire roof structure; B. Lifting system opening individual roof parts (roof structure lifting); C. Lifting system opening individual roof parts (roof structure lowering).

Roof structures with rotating system

Definition of rotating system: Roof structures with rotating system are rotated around the axis (Figure 18).

Examples: Civic Arena, USA (1961) is the first sports hall with a rigid retractable roof structure. The retractable roof structure of stainless steel was fully opened and closed by rotation around the vertical axis. It consisted of the main supporting arch and eight movable elements, of which six separate roof elements were circularly rotated and stacked. The elements were rotated by means of a moving mechanism consisting of rails, wheels, and electric motors. The building partially collapsed on its own and was completely demolished in 2012 (Figure 19).

Design of roof structures with rotating system

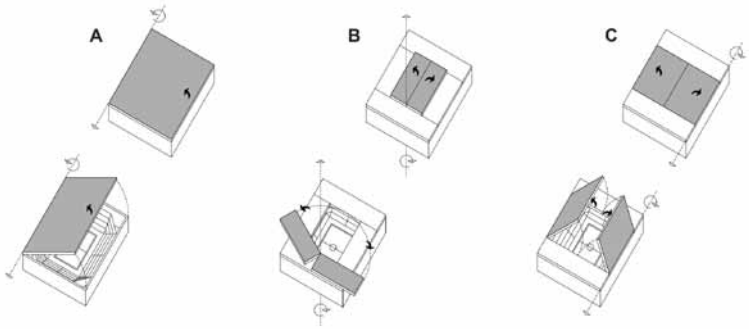


Figure 18: A. Rotation of the entire roof structure; B. Rotation of individual roof parts (rotation around the vertical axis); C. Rotation of individual smaller roof parts (rotation around the horizontal axis).

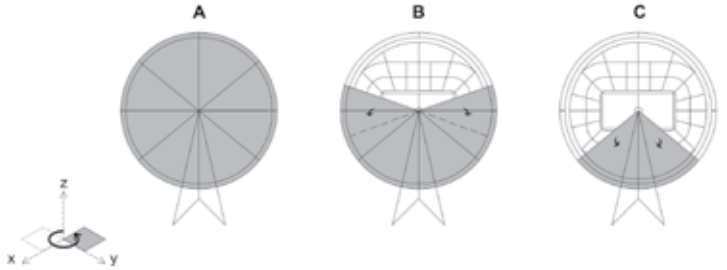


Figure 19: Civic Arena sports hall; demonstration of the roof structure rotation around the vertical axis (A - closed, B - half-open, C - open).

The multipurpose sports hall La Caja Mágica, Spain (2009) with a rigid steel roof structure has a combination of rotating and sliding systems. The building's roof is opened and closed with only one type of moving system or combination of both. Roof rotation around the horizontal axis is enabled by telescopic columns for each of the movable elements that change the roof pitch (Figure 20).

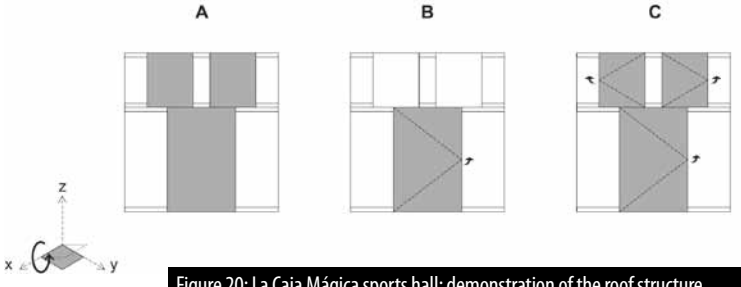


Figure 20: La Caja Mágica sports hall; demonstration of the roof structure rotation around the horizontal axis (A - closed, B - half-open, C - open).

Roof structures with folding system

Definition of folding system: A folding system enables elements of roof structures to be folded (Figure 21).

Design of roof structures with folding system

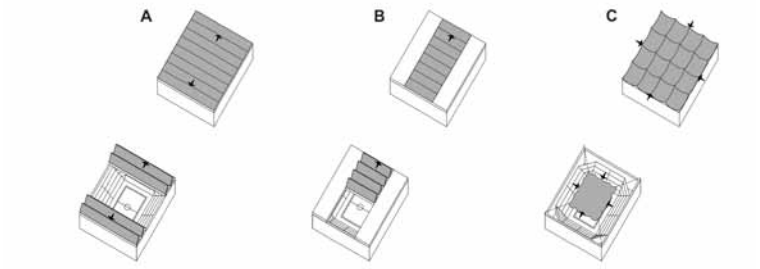


Figure 21: A. Folding of the entire roof structure B. Folding of individual roof parts (folding in the longitudinal direction of the building); C. Folding of individual smaller roof parts (folding into the centre of the building).

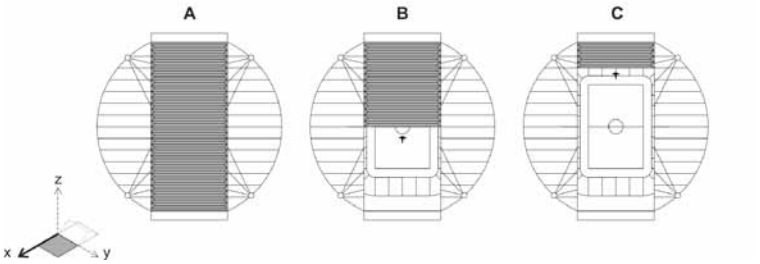


Figure 22: Toyota Stadium; demonstration of roof structure with folding system (A - closed, B - half-open, C - open).

Examples: Toyota Stadium, Japan (2001) illustrates a retractable roof structure composed of membranes that can be folded at the shorter side of the building. The roof is composed of fixed and movable elements. The fixed part of the roof covers stands along the longitudinal side of the playing area, while the movable elements cover stands at the transverse side of the playing area (Figure 22).

Waldstadion, Germany (1925) is a football stadium that was renovated in 2005. It has one of the largest retractable roof structures in the world. Stands are covered by a fixed roof structure, while an almost rectangular foldable membrane hovers over the playing field. Cradles of the foldable membrane are made of steel ropes that run from the centre and connect the support frame to form the roof. The roof membrane is folded into the centre of the stadium.

Roof structures with expandable system

Definition of expandable system: An expandable system is used to expand and contract the roof structure.

Example: Iris Dome was designed by inventor Chuck Hoberman. The design was first publicly exhibited in the Museum of Modern Art (MoMA) in New York in 1991 and introduced a new type of retractable roof that closes and opens like the iris of the eye. The retractable roof structure is composed of rigid panels or membranes attached to frames; they glide over one another to form a continuous surface in the form of a complete dome when fully extended (Figure 23).

Roof structures with expandable system

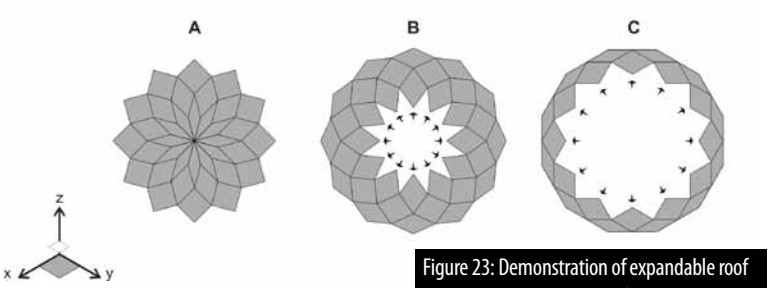


Figure 23: Demonstration of expandable roof structure (A - closed, B - half-open, C - open).

Roof structures with combined systems

Definition of combined systems: The roof structure is retracted by utilizing a combination of different systems (Figure 24).

Design of roof structures with combined systems

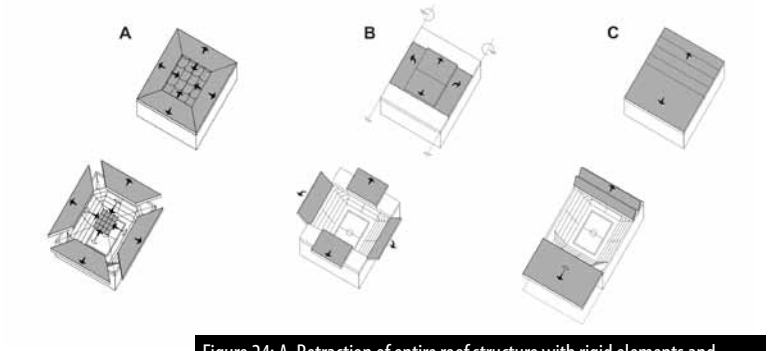
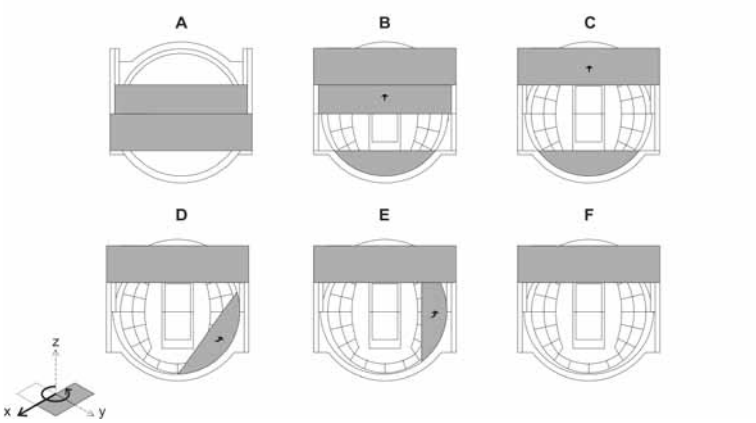


Figure 24: A. Retraction of entire roof structure with rigid elements and membrane (sliding system, folding system) B. Retraction of individual rigid roof parts (sliding system, rotating system); C. Retraction of entire rigid roof structure (sliding system, folding system).

Example: Toronto "Skydome", Canada is a multipurpose stadium, built in 1989. The geometry and design of the rigid retractable roof structure are very complicated and are result of a design that enables independent movement of elements (rotation, sliding). Movement is enabled by a mechanism of rails, wheels and electric motors that stacks four autonomous parts of the roof structure on the side of the building, opening up 90% of the floor area (Figure 25).

Figure 25: SkyDome stadium; demonstration of a combination of sliding and rotating of the roof structure (rotation around the vertical axis) (A - closed, B - partially open; 30%, C - half-open; 50%, D - partially open; 70%, E – open; 90%).



2.4 Architectural design of retractable roof structures

The architectural design of stadiums and sports halls with retractable roof structures follows compositional starting points adjusted to movement and a different functional design of the building as the building's structure changes from closed to open roof with opening and closing of the roof. Retractable roof structures increase the variety of possible activities taking place inside the building. All this affects the functional design and layout of the building as well as the size and number of supporting facilities. In case of multipurpose use of space it is necessary to adapt the design of the building (floor plans, sections) to requirements of different activities (size of event space, number of visitors, and type, number and size of supporting facilities).

Buildings with retractable roof structures have special properties, requirements and conditions that need to be taken into account and put attention to during planning (Schumacher, M., Schaeffer, O., Vogt, M., 2010; Ishii, K., 2000):

- the impact of movement on building users (feeling, experience);
- issue of safety during opening and closing of the roof structure;
- the speed of opening and closing of the roof structure;
- degree of openness of the building during movement of the roof structure (fully or partially open);
- multipurpose use of space in various positions of the retractable roof structure;
- impact of shade created by retractable roof structure;
- impact of wind when the retractable roof structure is open;
- characteristics of the space formed by closed or open retractable roof structure;
- type of building (open building, which a retractable roof structure changes to closed or closed building, which a retractable roof structure changes to open);
- installations design of movable elements;
- fire safety plan during the process of opening and closing of the roof;
- economic efficiency or viability of a retractable roof structure;
- influence of retractable roof structure on building management;
- cost increase arising from the movement of the roof structure.

In architectural design, movement of a roof structure may also appear as an act that allows the fundamental movable system to assume a new feature. With a specific moving system or a combination of them the following can be achieved:

- movable roof element transforms into stands (increased building's capacity) (Figure 26, A);
- movable roof element transforms into a roof outside the building (increased number of activities that can take place inside or outside the building) (Figure 26, B);
- movable roof element transforms into playing area (more playing areas inside the building) (Figure 26, C);
- retractable roof structure creates new space (more event spaces inside the building) (Figure 26, D);
- retractable roof structure transforms the building from stadium to hall (merging two building types into one) (Figure 26, E);
- retractable roof structure changes the building size (building adapts to the number of activities or visitors) (Figure 26, F).

Multipurpose use of retractable roof structures achieved with different moving systems

2.5 Constructural design of retractable roof structures

Use of retractable roof structures, research of structure features and technology solutions for the design of retractable systems allow us to take advantage of the moving elements to enhance the building's efficiency and adaptability to different needs of users, which is an architectural and engineering challenge.

Retractable roof structures are elements that bridge large spans, are heavy, have larger dimensions, and their movement takes place at high altitude. The increasing frequency of opening and closing of a roof structure also increases the interval of forces acting on the structure and deterioration of material due to continuous friction. During movement, both static and dynamic forces are most heavily acting on the moving mechanism and the roof's supporting structure. Weight of a retractable structure (the movable element) is composed of a top layer of the roof (outside layer), a load-bearing structure of the movable element, an inner layer of the roof (ceiling), and different elements of the installation and moving system. Further forces represent various additional loads such as snow, wind and other natural phenomena. Roof constructions can be made from various materials, such as steel, wood, concrete, high-quality steel, cables, braided cables, and recently carbon fibres and tapes, special membranes, or a combination of different materials. Retractable roof structures are moved using various moving mechanisms and leads that have been taken mainly from the industry

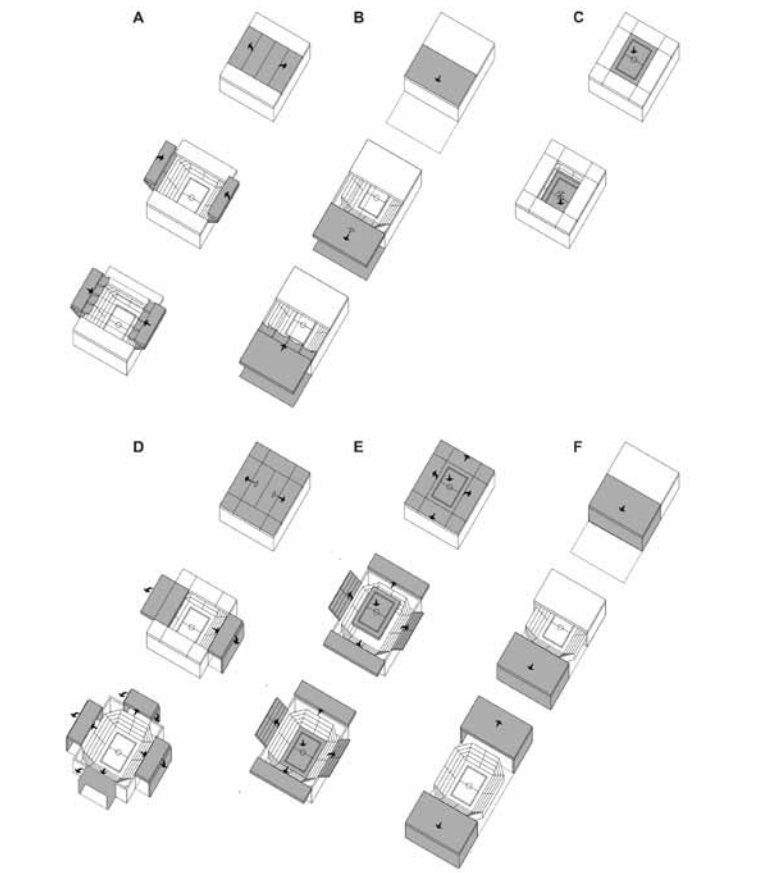


Figure 26: A. Movable roof element as stand (stand capacity change; open part of the building is covered by a folding membrane); B. Movable roof element as roof of the outdoor event space (different event spaces; open part of the building is covered by a folding membrane); C. Movable roof element as additional vertically movable playing area (different playing areas). D. Movable roof element as new space (different event spaces; movable roof parts create new volumes); E. Movable roof element as stand, event space (stand capacity change) F. Movable roof element as increase of event space (implementation of different activities).

(shipyards, oil platforms, ports). Thus, different wheels and electric motors, push systems, hydraulic lifts or winding cables are used that move the roof structure along cradles (rails) or surface (fixed part of the roof structure, secondary beams). The surface on which the retractable roof structure moves or rests has its specific constructional features, which are characterized by a large load weight, large point loads and load forces when moving and stopping. In all listed characteristics and requirements that determine the type and construction of the retractable roof structure the safety of building users and passers-by is of paramount importance.

2.6 Movement of fundamental systems of stadiums and sports halls

Adaptability of stadiums and sports halls has been characteristic for both building types since the beginning of their development (Nixdorf, S., 2009). The development of retractable roof structures has proceeded in parallel with the development of other mobile systems of a building (playing area, stands, and facade) because these methods and systems of movement are alike. The stadium and sports hall are becoming building types, in which most fundamental systems are moving to achieve flexibility in the implementation of various activities. Thus, various methods of movement of their fundamental systems have developed (Figure 27):

- movement of playing field within or outside the building (Figure 27, A): sliding system, lifting system, rotating system, combination of different systems. Movement of playing field allows the implementation of various activities inside the building and relocation of the playing area to the exterior of the building, where there are more suitable conditions for natural grass growth covering the pitch. Examples: University Sports Hall, Ljubljana, Slovenia (1997); moving system: lifting and lowering of playing area inside the building. Sapporo Dome, Sapporo, Japan (2001); moving system: sliding and rotating of playing area inside and outside the building. Cardinals Stadium, Glendale, Arizona, USA (2006); moving system: sliding of playing area outside the building.
- movement of stands within or outside the building (Figure 27, C): sliding system, lifting system, rotating system, folding or telescopic system, combination of different systems. Movement of stands allows adjustment of building's capacity (number of visitors), changes the shape of the auditorium in relation to the visitors' focus (longitudinal or central focus), and relocation of stands to the exterior of the building. Examples: Grand Stade, Saint-Denis, Paris, France (1994); moving system: sliding of stands. Crystal Ballpark, Seoul, Korea (1997); moving system: rotation of stands. Reyno de Nevarra Arena, Nevarra, Spain (2012); moving system: folding, lifting and lowering of stands.
- movement of facade (Figure 27, D): sliding system, lifting system, rotating system, folding system, combination of different systems. Facade movement has come about primarily as result of the need to facilitate movement of building's other fundamental systems. Examples: AT&T Stadium, Texas, USA (2009), moving system: sliding of facade. Olympic Basketball Arena, London, UK (2011); moving system: folding of facade.

An increasing number of stadiums and sports halls use at least one movable fundamental system; efficiency of movement is evident in the design of buildings with a combination of movable fundamental systems, since such buildings can adapt to almost any activity (sports, cultural, trade fair, and congress). The effectiveness or efficiency of the use of movable fundamental systems is achieved by taking the movement into account in the planning phase of the building's construction as in this way it is feasible to anticipate the possibility of multipurpose use of the building.

3. CONCLUSION

Typology of retractable roof structures provides basic guidelines for the design of stadiums and sports halls whose fundamental objective is flexibility to achieve high quality of the greatest possible number of different events and performances throughout the year. The frequency of movement, structural design, and types of movement have so far followed only the

Movable fundamental systems

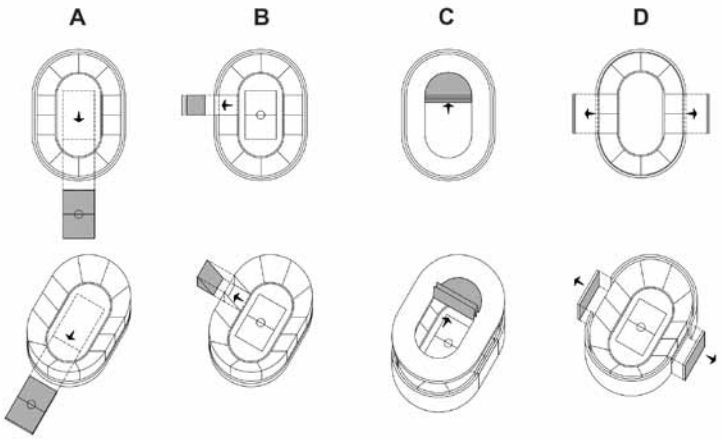


Figure 27: A. Movable playing areas; B. Movable stands; C. Movable roofs, D. Movable facade.

mentioned objective. Using movement in terms of changing the core functions of the fundamental system, a new meaning is added to the movable element. The purpose of retractable roof structures is not only to protect users from weather, increase the number of activities inside the building or provide ideal conditions for grass growth on the pith, but also to change the capacity of stands, increase the number of event spaces, achieve several different kinds of playing areas, and increase or decreases the event space size. All described acts are achieved through various methods and systems of movement and by a predetermined function (one or more) the fundamental system will assume. Planning of such a type of building requires a predetermined plan for transformation of a building or changing the characteristics of individual fundamental systems. Combining different types of movement and various functions of the moving system allows a range of different new forms of buildings that can adapt to daily changes, thereby allowing multiple use of space that provides high quality or equal conditions for all users. A building designed in this way enables high-quality and efficient management of the building and allows implementation of a maximum number of activities, which justifies the economical aspect of construction, use and maintenance of such building.

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Gašper Šmid, Gašper Rus, Samo Saje, Martin Klun, Jernej Nejc Lombar, Jan Ratej:

PROJEKT PROGRAMA PKP2: Ocena stanja železniških jeklenih mostov s pregledom metodologij za oceno preostale življenjske dobe

PKP2 PROGRAMME PROJECT: ASSESSMENT OF STEEL RAILWAY BRIDGES CONDITION AND REVIEW OF METHODOLOGIES FOR ASSESSMENT OF REMAINING LIFETIME.

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IZVLEČEK

Obravnavana je problematika slovenskega železniškega infrastrukturnega omrežja, kjer smo se osredotočili na analizo jeklenih železniških mostov in oceno njihove preostale življenjske dobe. Analizo smo opravili na podlagi vhodnih podatkov, pridobljenih s strani podjetja Slovenske železnice d.o.o., ki so zajemali geometrijske podatke mostov in podatke o prometnih obremenitvah. Slednji so nam služili za računsko analizo, saj je pri oceni preostale življenjske dobe jeklenih železniških mostov ključno utrujanje jekla, ki je povezano s cikli obremenjevanja. Vzpostavili smo spletno bazo, v kateri so dostopni osnovni podatki o mostovih ter pri nekaterih fotografije, lokacija in dokumenti v digitalni obliki. Metodologijo za oceno preostale življenjske dobe smo uporabili za most čez Savo pri Litiji. Izkazalo se je, da so rezultati zelo občutljivi na vhodne parametre. Preostalo življenjsko dobo mostov je težko izraziti v časovnih enotah, saj je fenomen utrujanja kompleksen in odvisen predvsem od količine pretovora (število vlakov, masa in število vagonov ter lokomotiv itd.) poleg tega tudi od velikosti obstoječih razpok na jeklenih elementih mostov, ki so zanesljivo prisotne. Rezultati uporabljenih metodologij so pomembni predvsem iz vidika primerjalne ocene varnosti med posameznimi mostovi.

KLJUČNE BESEDE

utrujanje, preostala življenjska doba, železniška infrastruktura, jeklen železniški most, prometne obremenitve, trajnost in palmgren-minerjevo pravilo

ABSTRACT

The issues of Slovenian railway infrastructure system are discussed. We focused on analyzing steel railway bridges and evaluation of their life expectancy. We gathered the input data from the company Slovenske železnice d.o.o. They include data like geometry and annual traffic loads. Latter we used in computational analysis. In evaluation of life expectancy of steel railway bridges, the fatigue of construction material has crucial affect. It is connected with loads cycles. We established web data base, where basic bridge data, photographs, location and digitalized documentation can be found. We used the methodology for life expectancy assessment for the bridge over Sava river near Litija. As it turns out, the results are sensitive for input parameters. Life expectancy of bridges is difficult to express in a time unit because the fatigue is a complex phenomenon. It is also dependent from the amount of loading (the number of trains, mass and the number of wagons, locomotives, etc.) and the size of cracks on steel construction elements. The results of used methodology are important for comparison of risk assessment between individual bridges.

KEY-WORDS

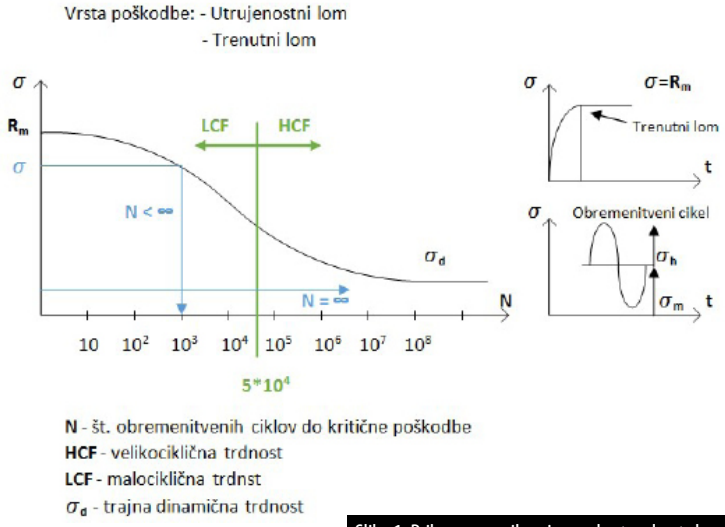
Fatigue, Life expectancy, Railway infrastructure, Steel railway bridge, Traffic load, Durability, Palmgren – miners rule

1. Predstavitev problematike in namen projekta

V Sloveniji je trenutno 1.226 km železniških prog, od tega 896 km enotirnih in 330 km dvotirnih. Vse pogosteje se odpira vprašanje o dejanski varnosti starih jeklenih mostov v Sloveniji. Prvi jekleni kovičeni železniški mostovi so bili zgrajeni konec 19. stoletja ter v začetku 20. stoletja. Najstarejši most je bil zgrajen že davnega leta 1860. Povprečna starost vseh železniških mostov v Sloveniji je 81 let. Nekateri mostovi se torej sedaj že približujejo svojemu stotemu letu obstoja medtem, ko je 60 mostov takšnih, da njihova starost presega 100 let. Mnogi so prestali več faz popravil in preživeli dve svetovni vojni, med katerima so bili verjetno izpostavljeni tudi preobremenitvam. Zahteve za projektiranje so bile v času načrtovanja teh mostov drugačne kot so danes, zato mostovi obratujejo pod ostrejšimi pogoji. Prometna obremenitev in letno število obremenitvenih ciklov se iz leta v leto povečuje, saj količina tovora na železniških progah raste, kar posledično vodi k vedno večjemu številu težkih tovornih vlakov v prometnih tokovih. Ta trend se bo zaradi okoljevarstvene politike nadaljeval. Uredba (EU) št. 1315/2013 navaja, da naj bi bila na jedrnem omrežju do leta 2030 zagotovljena minimalna hitrost tovornih vlakov 100 km/h, osna obremenitev vsaj 22,5 ton in dolžina vlakov 740 m. Tem kriterijem obstoječa železniška infrastruktura v Sloveniji žal ne ustreza. Namen projekta je torej reševanje aktualne infrastrukturne problematike Slovenije, ki ima velik vpliv na gospodarstvo in razvoj države. To smo poskušali doseči z oceno stanja obstoječih jeklenih mostov z oceno preostale življenjske dobe na slovenskem železniškem omrežju. Ta ocena namreč predstavlja prvi in osnovni korak za zagotavljanje primarnih zahtev. Primarne zahteve pri mostovih so varnost, uporabnost in trajnost, vse pa so pogojene z obremenitvami, katerim so izpostavljeni. Povečane obremenitve in večje število tovornih vlakov danes vplivajo na preostalo življenjsko dobo mostov, ki je pogojena predvsem z utrujanjem materiala tj. jeklenih nosilnih elementov. S pomočjo dobljenih podatkov smo tvorili bazo podatkov za izbran nabor mostov, v katero je možno dostopati na spletni strani: *http://pokreativnipoti.fgg.uni-lj.si*. Spletno stran smo ustvarili tudi z željo osvestiti slovensko javnost in predvsem upravljalca slovenskih železniških prog in lastnike mostov o problemu dotrajanosti železniških jeklenih mostov. Navsezadnje pa ponujamo vsem subjektom, ki načrtujejo, gradijo, vzdržujejo in upravljajo z železniško infrastrukturo, osnovne oziroma izhodiščne podatke za analizo mostov in tudi orodje za identifikacijo najbolj kritičnih mostov oziroma njihovih delov.

2. Teoretično ozadje

Utrujanje materiala je pomemben naraven proces pri katerem opazujemo spreminjanje lastnosti materiala pod vplivom zunanje obremenitve v določenem časovnem obdobju. Pri utrujanju začetne razpoke, ki so prisotne na površini ne glede na material, počasi rastejo. Rast razpoke napreduje počasi do kritičnega trenutka, ko se začne razpoka z eksponentno hitrostjo odpirati, kar se konča s krhkim prelomom materiala oziroma nosilnega elementa. Pri konstruiranju nas običajno zanima časovno obdobje v katerem bo nastal lom materiala. Z drugimi besedami nas zanima število obremenitvenih ciklov, ki jih bo material prenesel brez poškodb. Glede na to ločimo visoko in nizko ciklično trdnost. Angleško: High Cycle Fatigue (HCF) in Low Cycle Fatigue (LCF). (Slika 1)



Slika 1: Prikaz osnovnih pojmov obratovalne trdnosti.

Življenjska doba posameznega elementa konstrukcije, spoja dveh elementov ali celotne konstrukcije, ki je izpostavljena cikličnim obremenitvam je definirana kot število ciklov konstantne amplitude, ki jih bo konstrukcija zdržala do kritične poškodbe. Kritična poškodba je lahko definirana kot porušitev konstrukcije ali elementa, padec elastičnega modula, padec napetosti ali kritična velikost razpoke. Ključni parametri so: amplitude napetosti, ki se pojavijo na kritičnem mestu (najvišja σ_{max}, najnižja σ_{min} napetost in sprememba napetosti $\Delta\sigma$ – slika 1); geometrija (oblike prerezov elementov, koncentracije napetosti zaradi sprememb geometrije, napake in napetosti v zvarih, zarezni učinek); materialne karakteristike (ustrezna odpornost proti krhkemu lomu - žilavost, meja tečenja materiala). Poleg tega so vplivi okolja

Univerza v Ljubljani
Naložba v vašo prihodnost
Operacijo delno financira Evropska unija
Evropski socialni sklad
JAVNI SKLAD REPUBLIKE SLOVENIJE ZA RAZVOJ KADROV IN ŠTIPENDIJE
REPUBLIKA SLOVENIJA
MINISTRSTVO ZA IZOBRAŽEVANJE, ZNANOST IN ŠPORT

»Projekt delno financira Evropska unija, in sicer iz Evropskega socialnega sklada. Projekt se izvaja v okviru Operativnega programa razvoja človeških virov za obdobje 2007–2013, 1. razvojne prioritete »Spodbujanje podjetništva in prilagodljivosti« ter prednostne usmeritve 1.3. »Štipendijske sheme«, v okviru potrjene operacije »Po kreativni poti do praktičnega znanja«.

(izpostavljenost koroziji) pomembni parametri, ki posledično znižujejo življenjsko dobo.

2. Baza podatkov

Spletna baza podatkov je pregledno urejena zbirka železniških mostov v Sloveniji, kjer so shranjeni razpoložljivi splošni podatki o mostovih (Preglednica 1). Obenem omogoča samodejno vodenje statistike o mostovih. Za nekatere mostove smo iz arhivov pridobili razpoložljivo projektno dokumentacijo katero smo digitalizirali. Spletna baza se bo v prihodnje lahko dopolnjevala. Vneseni podatki so na voljo različnim subjektom, ki načrtujejo, gradijo, vzdržujejo ali upravljajo železniško infrastrukturo v Sloveniji.

Preglednica 1: Splošni podatki o mostovih.

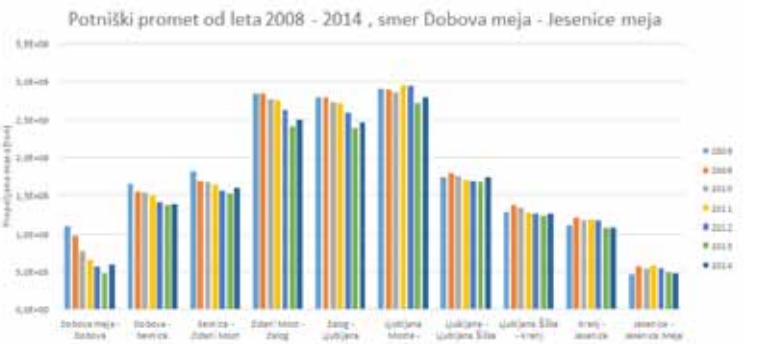
SVP (sekcija za vzdrževanje prog)	Objekt križanja	Svetla razpetina po poljih	Leto gradnje
št. proge	Statična razpetina po poljih	Leto morebitne rekonstrukcije oziroma sanacije	Glavna/ regionalna proga
Stacionaža	Tip objekta	Material prekladne konstrukcije	Svetla razpetina vseh pol
Statični sistem	Vrsta križanja	Stanje projektov obstoječega stanja	Vrsta konstrukcije

Za vsako območje sekcije za vzdrževanje prog (SVP) se na spletni strani nahajajo tudi diagrami obremenitev, kjer so prikazane obremenitve v tonah za posamezno leto. Diagrami so izdelani posebej za potniški, tovorni in skupni promet za posamezni progovni odsek (Slika 2).

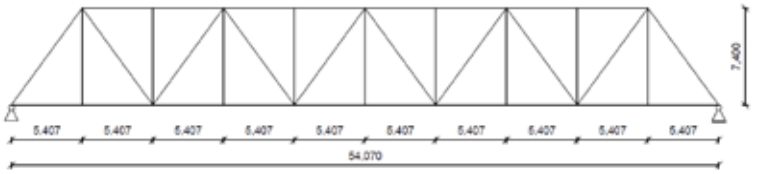
4. Obravnavani most in analiza nosilne konstrukcije

V okviru projekta smo analizirali most, ki se nahaja na glavni progi Zidani most – Ljubljana (levi tir) na stacionaži km 538+019,00. Most je bil zgrajen leta 1964 in do danes še ni bil rekonstruiran. Sestavljen je iz treh paličnih prostoležečih konstrukcij razpetin 53,09 m + 54,07 m + 53,09 m. Širina mostu znaša 5,0 m, višina mostu pa 7,4 m. Most je enotiren z odprtim vozliščem. V nadaljevanju obravnavamo samo sredinski del premostitvene konstrukcije z najdaljšim razponom (Slika 3).

Konstrukcijo sestavljata dva robna prostoležeča palična nosilca razpetine 54,07 m in višine 7,40 m. Zgornji pasovi so iz varjenega škatlastega prereza, spodnji pasovi pa so sestavljeni iz dveh »T« profilov, ki sta mestoma med seboj povezana. Tlačno obremenjene diagonale so iz varjenega škatlastega prereza, ostale pa iz varjenega »I« prereza. Vertikale so prav tako iz varjenega »I« prereza. Krajni diagonali tvorita skupaj s prvo prečko zgornjega



Slika 2: Prikaz primera obremenitev za tovorni promet smer Dobova meja - Jesenice meja.



Slika 3: Osnovna geometrija obravnavanega paličnega nosilca (kote so v metrih).

vetrnega povezja čelni portal, ki je statično gledano dvočlenski okvir. Brano sestavljajo vzdolžniki in prečniki iz varjenih »I« profilov. Prečniki so prostoležeči, vzdolžniki pa kontinuirni nosilci. Uporabljen material mostne nosilne konstrukcije je kvalitete S235. (Slika 4)

Tekom projekta smo izdelali več računskih modelov v programu Scia Engineer. Sprva smo modelirali glavni palični nosilec v ravnini. Za nanos vertikalne obtežbe smo uporabili fiktivni nosilec, ki je bil z glavnim paličnim nosilcem preko vertikalnih vešal v vozliščih členkasto povezan. Pri tem

Slika 4: Terenski prikaz obravnavanega mostu.

Slika 5: 3D prikaz računskega modela mostu.

modelu smo v vseh vozliščih preprečili izven-ravninski pomik, hkrati pa smo fiktivni nosilec zaradi stabilnosti ustrezno podprli. Brano smo modelirali ločeno z dvodimenzionalnim modelom. Preverili smo tudi spreminjanje notranjih statičnih količin pri različnih načinih podpiranja brane ter ugotovili, da se rezultati razlikujejo glede na način podpiranja.

Zaradi potrebe po naprednejšem ter natančnejšem modelu smo v nadaljevanju izdelali prostorski računski model konstrukcije. Tako smo lahko pri analizi zajeli nekatere vplive, ki jih ni moč obravnavati z dvodimenzionalnim modelom. Pri trodimenzionalnem modelu (Slika 5) zgornjega in spodnjega zavetrovanja nismo modelirali, saj je vpliv le-teh zanemarljiv pri upoštevanju le vertikalne pomične obtežbe. Zgornje in spodnje zavetrovanje služita za prenos horizontalnih obremenitev (veter, potres, obremenitve vlakov) in za zagotavljanje stabilnosti zgornjega pasu vertikalnega paličnega nosilca.

Pri računskem modelu smo obravnavali samo vertikalne pomične obtežbe, ki predstavljajo obremenitve vlakov na obravnavano mostno konstrukcijo. Stalna obtežba ter vse horizontalne obtežbe nas pri analizi niso zanimale, saj le-te nimajo vpliva na utrujanje materiala. Pri fenomenu utrujanja obravnavamo le spremembo napetosti v elementih, ta pa se pojavi zaradi obtežbe vlaka.

Na konstrukciji smo najprej določili obtežno pot po kateri se premika pomična obtežba. Obtežna pot je določena po vzdolžnikih preko cele konstrukcije. Med analizo se po obtežni poti premikata dve vzporedni sili. Za potrebe izračuna ovojnic smo definirali obtežne sheme po UIC 71 in mešane obtežne sheme (EC Mix) v skladu s standardom SIST EN 1991-2, dodatek 2.

Analiza podajnosti brane je zanimiva, saj se je v preteklosti vzdolžnike in prečnike dimenzioniralo na podlagi drugačnih računskih modelov kot se to počne danes. Današnja programska oprema omogoča naprednejšo oziroma natančnejšo analizo z uporabo trodimenzionalnega modela konstrukcije. S tem zajamemo medsebojne vplive različnih delov konstrukcije. V sklopu projekta smo izvedli analize s tremi računskimi modeli:

- prostorski računski model,
- model, kjer je brana podprta z nepomičnimi členkastimi podporami in
- model, kjer je vzdolžnik podprt z nepomičnimi členkastimi podporami.

5. Pregled metod za oceno preostale življenjske dobe mostu

Življenjsko dobo mostu smo računali z dvema metodama. Pri predhodnem vrednotenju smo uporabili metodo iz UIC 71. Pri podrobni preiskavi smo akumulacijo poškodb zajeli po Palmgren-Miner-jevim pravilu. V izračunih smo upoštevali, da znaša ekvivalentna konstantna amplituda napetosti pri 2 milijonih ciklov 71 MPa, kot veleva standard EC3, Del 1.9 za kovičene spoje.

5.1 Prva faza: Predhodno vrednotenje

V prvi fazi smo most analizirali z upoštevanjem parametrov, ki veljajo za nov most in z uporabo vseh veljavnih standardov. Mejne nosilnosti mostu nismo analizirali, ker se nosilnost v povprečni življenjski dobi mostov splošno ni izkazala za težavno. Osredotočili smo se na analizo utrujanja. Rezultati analize so pokazali kritične nosilne elemente mostu in kritične detajle. Izvedba analize je zahtevala podroben pregled razpoložljive projektne dokumentacije. Spodnji izraz nam poda oceno stopnje varnosti glede na utrujanje obravnavanega detajla mostu.

$$\mu_{fat} = \frac{\Delta\sigma_c \, f_{\gamma_{Mf}}}{\gamma_{ff} \cdot \Delta\sigma_{E,2}} = \frac{\Delta\sigma_c}{\gamma_{ff} \cdot \gamma_{Mf} \cdot \Delta\sigma_{E,2}}$$

μ_{fat} : stopnja varnosti zaradi utrujanja
γ_{ff} : delni varnostni faktor za amplitudo napetosti $\Delta\sigma E_2$
$\Delta\sigma_{E,2}$: ekvivalentna konstantna amplituda napetosti pri $2*10^6$ ciklov
$\Delta\sigma_c$: odpornost na utrujanje detajla pri $2*10^6$ ciklih (kategorija detajla)
γ_{Mf} : parcialni varnostni faktor za odpornost proti utrujanju $\Delta\sigma c$

Za $\mu_{fat} \geq 1$ je varnost na mejno stanje utrujanja elementa oziroma detajla zadostna, $\mu_{fat} < 1$ pa pove le to, da detajl ni varen. V tem primeru mora biti varnost zaradi utrujanja preverjena z natančnejšo metodo. Na podlagi določitve teh faktorjev varnosti je mogoče narediti seznam prednostnih nalog za nadaljnjo, bolj temeljito preiskavo. Ko imamo znane tiste kritične elemente konstrukcije (tisti deli, ki imajo faktor μ_{fat} manjši od ena), lahko z izračunom ocenimo preostalo življenjsko dobo zaradi utrujanja. Podatek o kritičnih elementih konstrukcije je pomemben za nadaljnje korake v analizi določitve preostale življenjske dobe, kakor tudi za nadaljnjo presojo potrebnih tehničnih, sanacijskih ali drugih ukrepov (omejitev hitrosti vlakov, teže tovora, števila prevozov...).

Spodaj (Preglednica 2) so prikazani rezultati za tri najbolj kritične elemente mostne konstrukcije. Pri upoštevanju letnega pretovora 25 milijonov ton ter materialnega varnostnega faktorja 1,35 smo ugotovili, da je življenjska doba na podlagi teh izračunov pri dveh elementih že potekla. Pretovor smo v drugem izračunu reducirali ter ga približali dejanskemu letnemu pretovoru zadnjih nekaj let. Poleg tega pa smo v drugem izračunu zmanjšali materialni varnostni faktor z namenom, da dobimo realnejše rezultate. Ugotovimo, da kljub realnejšem letnem pretovoru in zmanjšanju materialnega faktorja, še vedno nismo dobili pozitivne preostale življenjske dobe, zato smo prešli na naslednjo fazo.

Preglednica 2: Rezultati zračuna preostale življenjske dobe v prvi fazi z UIC71.

UIC 71 po EC

Upoštevanje **25 Mton/leto**, materialni varnostni faktor 1.35 (nov most) , referenčna trdnost utrujanja pri 2 milijonih ciklov je 71 Mpa

		λ1	λ2	λ3	λ4	λ	$\mu_{\lambda c}$			
ELEMENT VZ5 NAD PODPORO	φ = 1,196	1,03	1	1,04	1	1,0712	1,10	Prostala živ. doba	69,0	let
ELEMENT VZ3 V POLJU	φ = 1,196	1,03	1	0,87	1	0,8961	0,44	Prostala živ. doba	Potekla	let
ELEMENT P3 V POLJU	φ = 1,306	0,85	1	0,87	1	0,7395	0,67	Prostala živ. doba	Potekla	let

Upoštevanje **15 Mton/leto**, materialni varnostni faktor 1.00 (obstoječi most), referenčna trdnost utrujanja pri 2 milijonih ciklov je 71 Mpa

		λ1	λ2	λ3	λ4	λ	$\mu_{\lambda c}$			
ELEMENT VZ5 NAD PODPORO	φ = 1,196	1,03	0,90	1,04	1,00	0,96	1,66	Prostala živ. doba	69,0	let
ELEMENT VZ3 V POLJU	φ = 1,196	1,03	0,9	0,87	1	0,80649	0,66	Prostala živ. doba	Potekla	let
ELEMENT P3 V POLJU	φ = 1,306	0,85	0,9	0,87	1	0,66555	1,01	Prostala živ. doba	0,0	let

5.2 Druga faza: Podrobna preiskava

V drugi fazi smo most podrobneje analizirali. Izračunali smo kopičenje oziroma akumulacijo poškodb. Za določitev ocene življenjske dobe smo uporabili linearni Palmgren-Miner-jev zakon, ki ga opišemo s spodnjim izrazom.

$$D = \sum \frac{n_i}{N_i} \leq 1$$

n_i : Število ciklov, ki se zgodijo na območju razpona napetosti, $\Delta\sigma i$ iz spektra napetosti

N_i : Število ciklov, ki ustreza določeni trdnosti utrujanja pri razponu napetosti v območju $\Delta\sigma_i$

V prvem koraku druge faze smo poskušali upoštevati dejanske obremenitve v življenjski dobi mostu. Obtežba predstavlja največjo negotovost v primerjavi z drugimi dejavniki. Sheme prometnih obtežb za železniške mostove po SIST EN 1991-2, ki smo jih uporabili v prvi fazi, temeljijo na pričakovanem obsegu prometa v prihodnosti ter na težah in hitrostih sodobnih lokomotiv in vagonov (tovornih in potniških). Na žalost smo uspeli pridobiti podatke le za preteklih nekaj let. Na te podatke smo se oprli tudi pri napovedi prometnih obremenitev v prihodnosti.

Pri drugem koraku druge faze računski modeli običajno vsebujejo določene poenostavitve glede na dejansko konstrukcijo. Te poenostavitve običajno nimajo bistvenega vpliva na izračun globalnega odziva konstrukcije in na izračun napetosti v prerezih. Pri analizi lokalnega obnašanja detajlov (npr. spojev) pa imajo velik vpliv koncentracije napetosti, začetna poškodovanost in rast razpok, ki v izračunu niso zajeti. Prav tako se lahko velik vpliv pokaže pri lokalni prerazporeditvi obtežbe. Poleg tega v konstrukciji nastajajo napetosti zaradi nihanja (sekundarne napetosti), vibracije, deformacije iz ravnine. Ti učinki se pri statični analizi upoštevajo preko različnih faktorjev na obtežbo. Analize mostu na treh različnih modelih so pokazale odstopanja med rezultati posameznih računskih modelov, ki pomembno vplivajo na pojav utrujanja, na globalen odziv konstrukcije pa praktično nimajo vpliva. V nekaterih primerih smo opazili tudi do 40% razlike pri izračunu sprememb napetosti, kar pomeni za faktor 2,7 nižjo preostalo življenjsko dobo.

Če preko izraza za Palmgren-Miner-jev zakon škode dobimo vrednost večjo kot 1, je potrebno upoštevati resne posledice okvare oziroma porušitve. Lahko se izvede tudi strokovni pregled konstrukcije na terenu. Na koncu te faze je zelo pomembno, da napišemo poročilo, ki vsebuje identifikacijo kritičnih elementov oziroma delov konstrukcije, povzetek izračunov ter končne sklepe.

Podobno kot v prvi fazi smo sprva v izračunu upoštevali 25 milijonov ton letnega pretovora, kot določa standard EC3 1.9. Rezultati izračuna kažejo, da je življenjska doba mostu že potekla. V drugem izračunu pa smo upoštevali 15 milijonov ton letnega pretovora, kar je realnejši vhodni podatek in ugotovili, da ocenjena preostala življenjske doba znaša še dobrih 30 let (Preglednica 3).

6. Zaključek

Življenjsko dobo smo računali najprej z grobimi, nato pa z vedno realnejšimi ocenami. Najprej smo življenjsko dobo v grobem izračunali po standardu UIC 71 za vse elemente, kasneje pa smo preverjali le tri najbolj kritične elemente po Palmgren-Minerjevem pravilu. Če se z uporabo grobih metod izkaže, da je življenjska doba mostu že potekla, potem sledi še natančnejša analiza mostu. V kolikor se izkaže, da je tudi po natančnejših metodah ocenjena življenjska doba nekega elementa že potekla, je potrebno opraviti pregled mostu oziroma kritičnega elementa na terenu.

MINERJEVO PRAVILO o linearni akumulaciji poškodb (ob predpostavki, da en vlak povzroči en cikel v obravnavanem elementu)

Upoštevanje **25 Mton/leto**, faktor koncentracije napetosti k=1.0, referenčna trdnost utrujanja pri 2 milijonih ciklov je 71 Mpa

ELEMENT VZ5 NAD PODPORO	φ =	1,196	∑k = 1	Prostala živ. doba	2173,1 let
ELEMENT VZ 3 V POLJU	φ =	1,196	∑k = 1	Prostala živ. doba	-0,8 let
ELEMENT P3 V POLJU	φ =	1,306	∑k = 1	Prostala živ. doba	161,9 let

Upoštevanje **15 Mton/leto**, referenčna trdnost utrujanja pri 2 milijonih ciklov je 71 Mpa

ELEMENT VZ5 NAD PODPORO	φ =	1,196	∑k = 1	Prostala živ. doba	3648,0 let
ELEMENT VZ 3 V POLJU	φ =	1,196	∑k = 1	Prostala živ. doba	32,4 let
ELEMENT P3 V POLJU	φ =	1,306	∑k = 1	Prostala živ. doba	303,1 let

Preglednica 3: Rezultati izračuna preostale življenjske dobe v drugi fazi.

Račune smo pri vsaki metodi vodili tako, da smo najprej vzeli zelo konservativne vhodne podatke, nato pa smo za izračun skušali pridobiti čim realnejše vhodne podatke. Najprej smo za oceno utrujanja uporabili metodo UIC 71, ki je nekoliko enostavnejša in smo z njo na varni strani. V vseh izračunih smo upoštevali konstanten letni pretovor za vsa leta uporabe mostu. Da bi lahko naredili realnejšo in bolj zanesljivo oceno preostale življenjske dobe, bi morali imeti podatke o letnem pretovoru za vsa pretekla leta. Tako bi lahko pravilno upoštevali vso zgodovino obremenjevanja mostu, ki nam bi pripomogla k zanesljivejši oceni preostale življenjske dobe. Prav tako, pa bi na podlagi teh podatkov lažje ocenili trend povečevanja letnega pretovora v prihodnje, ki je prav tako ključen pri izračunu preostale življenjske dobe. Ugotovili smo, da nam predpostavka, ki v izračunu preostale življenjske dobe upošteva en cikel spremembe napetosti pri prevozu enega vlaka ne poda natančnih rezultatov oziroma poda različne rezultate kot pri primerih kjer smo v izračunu upoštevali vse cikle pri prevozu vlaka. Predpostavka, ki upošteva vse cikle realnejše opisuje napetostno stanje v prerezu. V našem primeru torej ugotovimo, da je neprimerno upoštevati samo en cikel v izračunu, saj so rezultati zelo različni od rezultatov po metodi, ki upošteva vse cikle.

Na podlagi rezultatov, ki smo jih dobili z izračuni ne moremo točno napovedati, koliko znaša dejanska preostala življenjska doba. So pa dober pokazatelj najbolj kritičnih elementov, ki jim je pri pregledu na terenu potrebno posvetiti večjo pozornost. Življenjsko dobo se lahko natančnejše napove le s pregledom na terenu, ko je znana razpokanost nekega elementa.

Kot smo že omenili je v Sloveniji ogromno število starih mostov, katerih življenjska doba se počasi izteka. Zaradi vse večjih obremenitev železniške infrastrukture se bo stanje mostov še poslabšalo, evropskih smernic na tem področju pa bo postale še bolj nedosegljive.

III.

DELAVNICE

WORKSHOPS

OGRAJE IN OGRAJNI ELEMENTI
FENCES AND FENCE ELEMENTS

Ljubljana, Slovenija

2014/2015

TIP DELAVNICE *TYPE OF WORKSHOP*
arhitekturna delavnica/slovenska

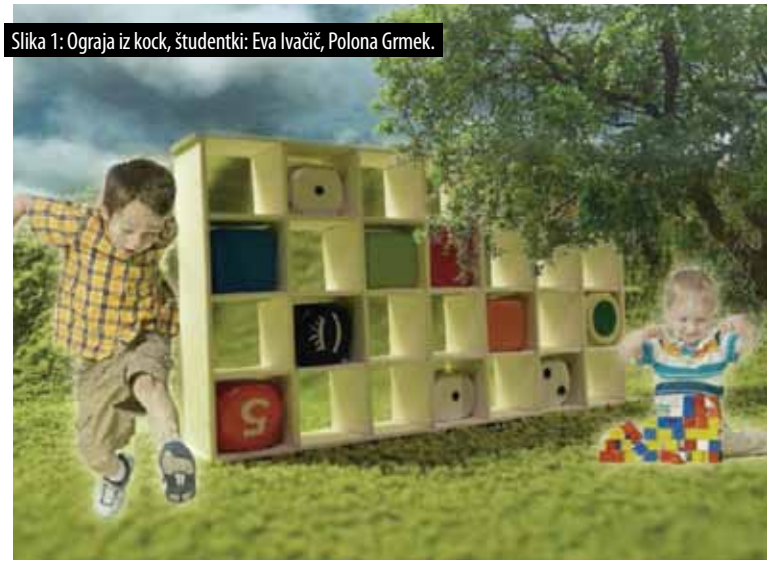
MENTORJI *MENTORS*
prof. mag. Peter Gabrijelčič, doc. dr. Alenka Fikfak, doc. dr. Špela Hudnik, doc. Mojca Gregorski, asist. dr. Gregor Čok, Urša Kalčič, tehnični sodelavec

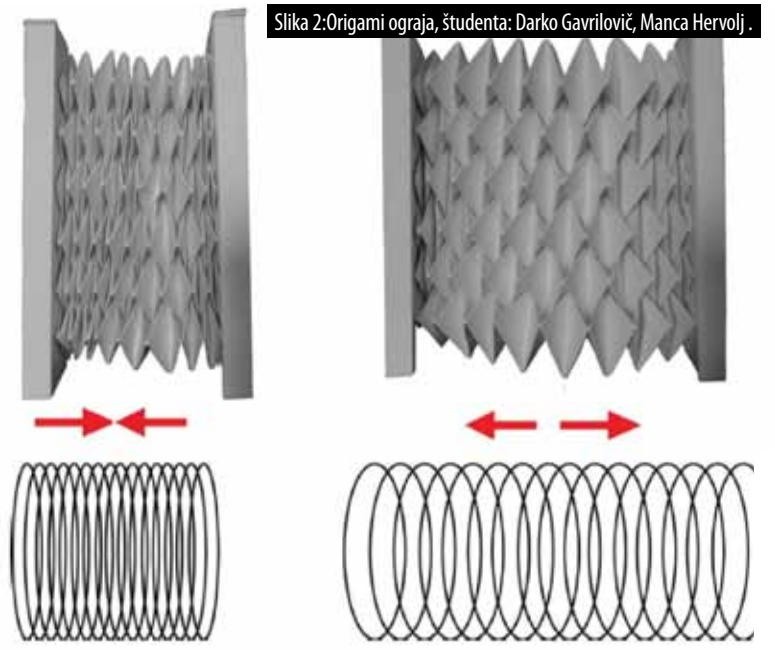
ŠTUDENTJE *STUDENTS*
Študentje 2.- 5. letnika pri predmetu Projektiranje nosilca prof. mag. Peter Gabrijelčič in 4. letnika pri predmetu Projektiranje doc. dr. Alenka Fikfak.

ORGANIZATOR *ORGANISATION*
Univerza v Ljubljani, Fakulteta za arhitekturo

DATUM IN KRAJ RAZSTAVE *DATE AND LOCATION OF EXHIBITION*
23. 10. 2014, Ljubljana, UL, Fakulteta za arhitekturo, Fabianijeva predavalnica

GRADIVO PRIPRAVIL *MATERIALS PREPARED BY*
asist. dr. Gregor Čok


Slika 1: Ograja iz kock, študentki: Eva Ivačič, Polona Grmek.


Slika 2:Origami ograja, študenta: Darko Gavrilovič, Manca Hervolj .

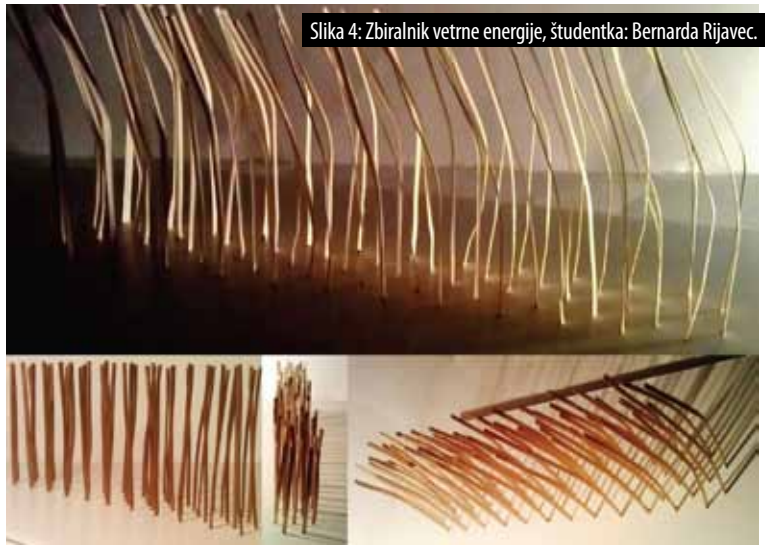
VSEBINA

Delavnica »Ograje in ograjni elementi« je bila organizirana kot eksperimentalno projektno načrtovanje brez znane lokacije in objekta. Namenjena je bila vzpodbujanju kreativnega razmišljanja o detajlih, tehnologiji, uporabnosti in obliki. Predmet obravnave so bili ograjni elementi in njihova uporaba v arhitekturnem načrtovanju. V prvi fazi so bili v okviru posameznih skupin ali individualnega dela razviti številni predlogi za uporabo alternativnih materialov in tehnologij. Ta faza je bila izrazito raziskovalna in posvečena predvsem »ideji« in oblikovanju nekonvencionalnih rešitev. Razvile so se tri skupine rešitev:

- ograje za aplikacijo v stavbah (ograje za višinsko zaščito, oporo, razmejitev interierja itd.)
- ograje za aplikacijo v eksterierju (razmejevanje programov in prostorskih ureditev, horizontalna zaščita itd.)
- druge oblike ograjnih elementov (orientacija v prostoru, označevanje, opozarjanje, itd.)

Glede na strukturo in način uporabe se je izoblikoval širok spekter rešitev: stacionarne, mobilne, trajne, začasne, zvočne, svetlobne; ograje, ki razmejujejo; omejujejo ali označujejo.
V drugi, aplikativni fazi so študentje prikazali potencial za njihovo uporabo v arhitekturi. S pomočjo delovnih maket so preizkušali izvedljivost detajlov in tehnološko funkcionalnost. Z različnimi grafičnimi orodji (renderji, fotomontaže, makete) so bile prikazane dejanske rešitev v prostoru.


Slika 3: Spirala, študenta: Maja Kastelic, Uroš Pirna.


Slika 4: Zbiralnik vetrne energije, študentka: Bernarda Rijavec.

ABSTRACT

The workshop "Fences and Fence Elements" was organised as an experimental project planning without a known location or structure. The subject matter was fence elements and their application in architectural planning. In the first phase, in the framework of individual groups and work, many proposals for using alternative materials and technologies were developed. This phase was distinctly research-oriented, and particularly dedicated to the "idea" of fence elements. In the second, application phase, the students demonstrated the potential of their application in architecture. Three groups of solutions were formulated: (1) fences to be used in buildings; (2) fences to be used in exteriors, and (3) other types of fence elements.

PRENOVA NADSTREŠKA IN VHODNE AVLE FAKULTETE ZA ELEKTROTEHNIKO UNIVERZE V LJUBLJANI
RENOVATION OF THE ENTRANCE HALL OF THE FACULTY OF ELECTRICAL ENGINEERING, UNIVERSITY OF LJUBLJANA

Ljubljana

2014/2015

TIP DELAVNICE *TYPE OF WORKSHOP*
arhitekturna oblikovalska delavnica/slovenska

MENTORJI *MENTORS*
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ORGANIZATORJA *ORGANISATION*
Univerza v Ljubljani, Fakulteta za elektrotehniko in
Univerza v Ljubljani, Fakulteta za arhitekturo

DRUGI SODELUJOČI *OTHER PARTICIPANTS*
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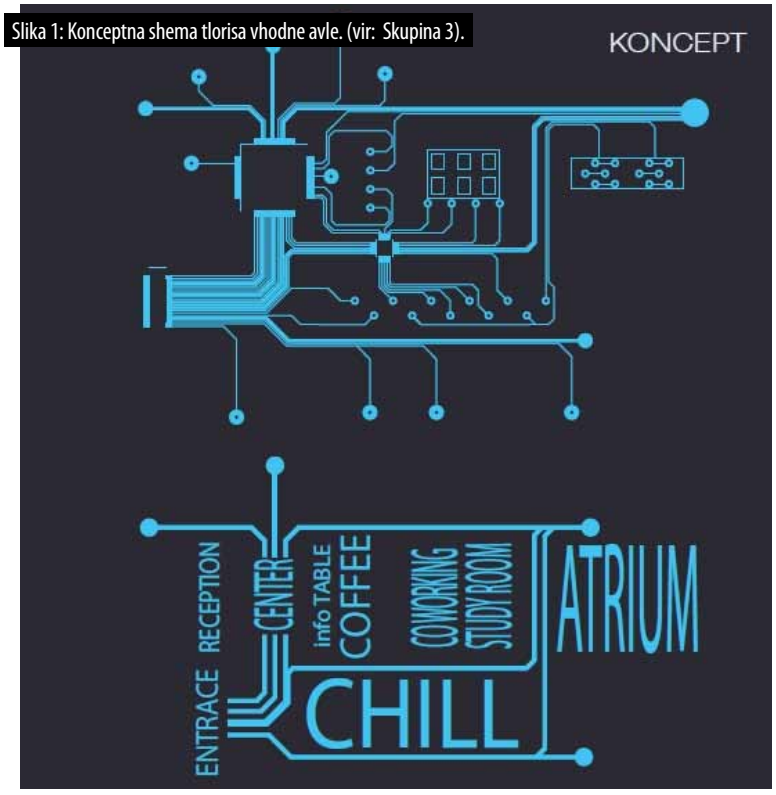
NAROČNIK *CLIENT*
Univerza v Ljubljani, Fakulteta za elektrotehniko

DATUM IN KRAJ RAZSTAVE *DATE AND LOCATION OF EXHIBITION*
8. 4. 2015, avla Fakulteta za elektrotehniko UL

GRADIVO PRIPRAVILA *MATERIALS PREPARED BY*
Urška Kalčič, teh. sod.



Slika 1: Konceptna shema tlorisa vhodne avle. (vir: Skupina 3).


Slika 2: Vizualizacija delovnih kotičkov v vhodni avli. (vir: Skupina 1).


Slika 3: Maketa vhodne avle z prikazom »svetlobnih kanalov« na stropu. (vir: Skupina 4).


Slika 5: Shematski prikaz osrednjega elementa »tribune« v vhodni avli. (Vir: Skupina 5).

VSEBINA

Cilj delavnice je bil predvsem v soočanju študentov, razdeljenih po skupinah, z projektiranjem v praksi. V tam namen so bili študentje razdeljeni po skupinah, kjer so morali v prvi fazi najti način medsebojne komunikacije in usklajevanja idej ter jih potem implementirati v neko skupno rešitev. Rešitve so bile nato predstavljene na razstavi na Fakulteti za elektrotehniko in pa tudi preko javne predstavitve, kjer so študentje morali v omejenem času sporočiti bistvo javnosti in pa bodočim ocenjevalcem rešitve.

Pomembna izkušnja za študente arhitekture je bilo tudi soočenje s tehnologijami, ki jih je naročnik delavnice, fakulteta za elektrotehniko, želel vključiti v prenovo vhoda in vhodne avle. Tako ni bil pogoj za dober rezultat le dobro oblikovan interier in programska dispozicija, am-pak tudi uporaba naprednih tehnologij.

Z delavnico so bili doseženi in preseženi začrtani cilji. Parcialne rešitve iz vseh petih nalog bodo v prihodnosti podlaga za dejansko prenovo avle in vhodnega dela. Študentje pa so v pripravo projektov tudi aktivno vključeni.

ABSTRACT

The main goals of the workshop were to establish a cooperation among the Faculty of archi-tecture and the Faculty of electrical engineering and to present actual work on architectural projects to the participating students. Students experienced the necessary cooperation amongst various team members, the teams competitiveness in designing the best solution and then face the judges and the public while successfully presenting their work.

The workshop were achieved and exceeded the outlined objectives. Partial solutions from all five tasks will be in future, the basis for the actual renovation of the lobby and the entrance part. Students are actively included in technical preparation of the project.

PREDSTAVITEV SEUL SEMINARJA – URBANA EKOLOGIJA
SEOUL STUDIO STATEMENT - URBAN ECOLOGY

Ljubljana, Slovenia

2015

TIP DELAVNICE *TYPE OF WORKSHOP*
joint workshop/Seoul, Ljubljana

MENTORJI *MENTORS*
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ŠTUDENTJE *STUDENTS*
Soongsil University, School of Architecture, Department of Architecture: students from the Design studio prof. PhD Jung In Kim, AIA LEED AP; University of Ljubljana, Faculty of architecture: students from the Design studio assist. prof. PhD Alenka Fikfak

ORGANIZATORJA *ORGANISATION*
University of Ljubljana, Faculty of architecture

NAROČNIK *CLIENT*
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DATUM IN KRAJ RAZSTAVE *DATE AND LOCATION OF EXHIBITION*
8.6.2015, Presentations in Vurnikova lecture room, UL, Faculty of architecture

GRADIVO PRIPRAVILA *MATERIALS PREPARED BY*
prof. PhD Jung In Kim, AIA LEED AP, assist. prof. PhD Alenka Fikfak

Figure 1: Street Scene of Seoul 2030 filled with PC Game Room (PC Bang) and Examinees' Residence (Gosi Bang).

Figure 2: Skyline of Gangnam 2030, Apartments with Private Tutoring Space (Automized Hakwon).

VSEBINA

Namen seminarja je raziskati problem urbane sposobnosti in oblikovanja identitete, ki ga proučujemo v vzhodni Aziji. Temeljno vprašanje je naslednje: »Kakšen naj bo naš oblikovalski pristop, predvsem v povezavi s konceptom ekologije, da se bo razlikoval od drugih pristopov v sodobni praksi?« Prevladujoče ocenjevanje v povezavi z ekologijo tu razumemo kot visoko modernistično vizijo ekstrapolacije tehnične racionalnosti in torej izvajanja sistemskega mehanizma za trajnost in razširjenost tehnoloških okolij. Ta futuristični urbanizem – ki ga predstavljamo v zeleni, globalno povezani, funkcionalno opredeljeni in visoko nadzorovani okoljski ustvarjalnosti – redko predlaga lokalne programe na mikro ravni, torej kako navadni prebivalci ustvarjajo svoje javne prostore in se razširjajo na podlagi lokalnih odzivov. Ekologijo si, ločeno od neurejenega in nepredvidljivega dogajanja na cesti, tukaj predstavljamo kot očiščen arhitekturni načrt z idealizirano raznolikostjo, ki predstavlja visoko sistematizirana okoljska udobja, ki so privlačna za potrošnike, ki potujejo po »prostoru tokov«. Prostor si predstavljamo kot stroj, ki izdeluje ekološko utopijo, življenja ne narekujejo vsakdanji ritmi potreb in želja prebivalcev, temveč predpisane dejavnosti strateškega načrtovanja in politik »od zgoraj navzdol«. Pri takem nastajanju prostora oblikovanje razlagamo kot »reševanje problema« za izboljšanje tehnično-formalnih obetov, brez družbeno-izkustvenih kvalitet.

ABSTRACT

In the studio, our intention is to keep researching the urban viability and identity formation that we have been exploring in East Asia. A core question is this: "What meaningful design approach can we imagine other than the ones framed for the contemporary practice, particularly relating to the concept of ecology?" Prevailing assessment to ecology is here understood as a High-Modernist vision of extrapolating the technical rationality and thereby implementing the systemic mechanism for sustainability and ubiquity of techno-environments. Presented in a green, globally connected, functionally defined and highly controlled spatial imagination, this futuristic urbanism rarely suggests micro-level local programs for how ordinary residents create their own public spaces and extend themselves by means of local resonances. Separated from locals' messy and unpredictable street scenes, ecology is here imagined as the sanitized blueprint with its idealized diversity and presents highly systemized environmental comforts that are attractive to consumers riding on "the space of flow." Where space is imagined as a machine for creating an ecological utopia, life world is registered not by quotidian rhythms of citizens' needs and desires but by prescriptive routines of strategic planning and top-down policies. In such production of space, design is interpreted as "solving a problem" for bettering the techno-formal outlooks, devoid of socio-experiential qualities.

RAZVOJNI POTENCIALI PODEŽELSKIH OBMOČIJ IN CELOVITA PRENOVA VASI – ISTRA 2015

DEVELOPMENT POTENTIALS OF RURAL AREAS AND COMPLETE SETTLEMENT RECONSTRUCTION – ISTRA 2015

Korte, Slovenija

april 2015

TIP DELAVNICE *TYPE OF WORKSHOP*
mednarodna prostorska delavnica/angleška

MENTORJI *MENTORS*
izv. prof. dr. sc. Krunoslav Šmit, SZ Af; doc. dr. Alma Zavodnik Lamovšek, UL FGG; izr. prof. Mojca Golobič, UL BF; doc. dr. sc. Sanja Gašparović, SZ Af; v. asist. dr. sc. Lea Petrović Krajnik, SZ Af; viš. pred. mag. Maja Simoneti, UL FGG; asist. Gašper Mrak, UL FGG

ŠTUDENTJE *STUDENTS*
Magistrski študijski program Prostorsko načrtovanje (UL Fakulteta za gradbeništvo in geodezijo): Miha Bevcer, Špela Blatnik, Katarina Čirič, Anita Ferlin, Davor Grabar, Suzana Kužatko, Gašper Okršlar, Ana Plavčak, Matej Plešej, Nika Podbevšek, Eva Primožič, Irena Rojko, Maja Weisseisen;
Visokošolski strokovni program Tehnično upravljanje nepremičnin (UL, Fakulteta za gradbeništvo in geodezijo): Petra Cetin;
Magistrski študijski program Krajinska arhitektura (UL, Biotehniška fakulteta): Tadej Bevk, Lara Gligić, Tomislav Krnač, Vlasta Damjanovič;
Študijski program Diplomski studij arhitekture i urbanizma (Sveučilište u Zagrebu, Arhitektonski fakultet): Lara Brmbolić, Irena Marković, Mateja Nosil, Ana Oršiček, Ana Pljuščec, Valentina Štivičić;
Erasmus študenta z univerze Warsaw University of Technology: Maria Kupryjaniuk, Robert Słowikowski

INSTITUCIJE *INSTITUTIONS*
UL Fakulteta za gradbeništvo in geodezijo, UL Biotehniška fakulteta, Sveučilište u Zagrebu, Arhitektonski fakultet, Regionalni razvojni center Koper

ORGANIZATORJA *ORGANISATION*
Univerza v Ljubljani, Fakulteta za gradbeništvo in geodezijo

GRADIVO PRIPRAVILA *MATERIALS PREPARED BY*
asist. Gašper Mrak, Špela Blatnik

DRUGI SODELUJOČI *OTHER PARTICIPANTS*
Slavko Mezek – Regionalni razvojni center Koper, Andrej Medved – Lokalna skupnost Šmarje, Dane Podmenik – Ekohumanitatis, Nara Petrovič – Trajnostni park Istra v Hrvojih, Janez Forte – Ekološka kmetija Forte pri Sv. Petru

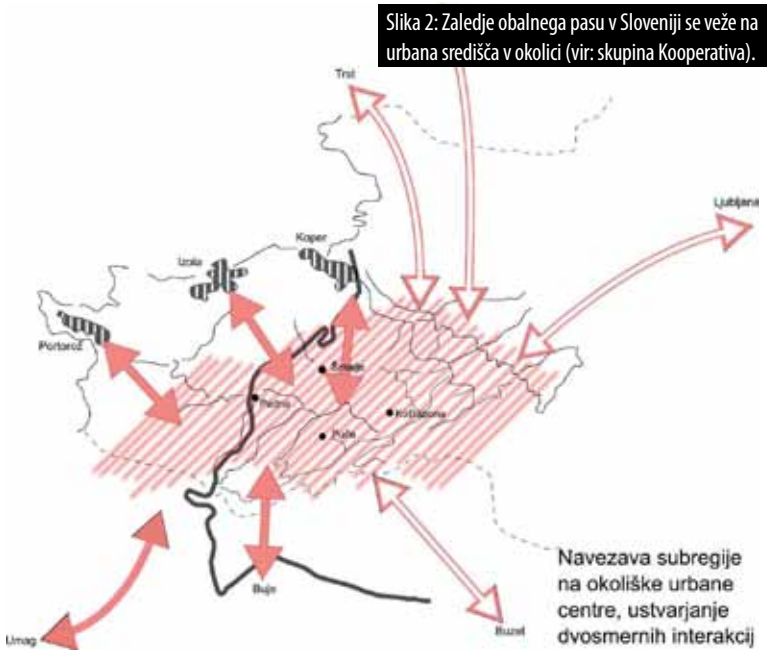
COBISS *Slovene Co-operative Online Bibliographic System and Services*

Zavodnik Lamovšek, A. (ur). 2015. Razvojni potenciali podeželskih območij in celovita prenova vasi. Mednarodna študentska delavnica Istra 2015. Ljubljana, Univerza v Ljubljani, Fakulteta za gradbeništvo in geodezijo: 116 str. URL: http://drugg.fgg.uni-lj.si/5162 (pridobljeno: 15. 10. 2015).

Zavodnik Lamovšek, A. (ur.), 2015. Razvojni potenciali podeželskih območij in celovita prenova vasi. Mednarodna študentska delavnica Istra 2015. Ljubljana, Univerza v Ljubljani, Fakulteta za gradbeništvo in geodezijo, 116. str.

»Operacijo delno financira Evropska unija iz Evropskega socialnega sklada ter Ministrstvo za izobraževanje, znanost in šport. Operacija se izvaja v okviru Operativnega programa razvoja človeških virov za obdobje 2007–2013, razvojne prioritete 3: Razvoj človeških virov in vseživljenjskega učenja; prednostne usmeritve 3.3: Kakovost, konkurenčnost in odzivnost visokega šolstva.«

Slika 1: Predstavitev plakatov ob zaključku mednarodne delavnice (foto: Š. Blatnik, 2015).



Slika 2: Zaledje obalnega pasu v Sloveniji se veže na urbana središča v okolici (vir: skupina Kooperativa).

VSEBINA

V organizaciji Fakultete za gradbeništvo in geodezijo (UL FGG) in v sodelovanju s Fakulteto za arhitekturo Univerze v Zagrebu se je v aprilu 2015 v slovenski Istri odvijala mednarodna delavnica z naslovom »Razvojni potenciali podeželskih območij in celovita prenova vasi«. Glavni namen delavnice je bil spoznavanje s projektnim delom na terenu, kjer so se študentje srečali s problemi prostorskega načrtovanja, sodelovali so z različnimi deležniki v prostoru (lokalne skupnosti, lokalni prebivalci, regionalne razvojne agencije, društva …) in se nenazadnje ukvarjali z razvojnimi potenciali območja slovenske in hrvaške Istre.

Metodološki pristop celotne delavnice je bil razdeljen v 3 sklope: 1. sklop se je nanašal na vsebinske priprave pred odhodom na teren, 2. sklop je predstavljala delavnica v slovenski Istri (Korte), zadnji, 3. sklop pa je potekal po vrnitvi z delavnice in je obsegal pripravo zaključnih rezultatov in člankov za strokovno publikacijo. V pripravljalni fazi (1. sklop) so se študenti s pomočjo literature in analize statističnih podatkov seznanili s stanjem, problemi in potenciali obravnavanega območja. V štirih skupinah so izdelali analize na področjih demografije, grajenih struktur, lokalnih virov in dejavnosti kot izhodišče za razvojno načrtovanje in načrtovanje dostopnosti do območja. Končni rezultat pripravljalne faze so bila poročila, kartografski prikazi in plakati.

Podrobneje so plakati opisani v strokovni publikaciji z naslovom »Razvojni potenciali podeželskih območij in celovita prenova vasi, mednarodna delavnica, Istra 2015«. V publikaciji so objavljeni prispevki vseh sodelujočih, torej mentorjev, lokalnih deležnikov in študentov, od začetne pripravljalne faze pa do oblikovanja končnih zaključkov in strokovne publikacije.

Mednarodna delavnica kot oblika dela je bila za študente dobrodošla popestritev običajnih vaj, pri čemer je največ štelo dejstvo, da so se s problematiko območja dejansko ukvarjali »in situ«. Ko si na terenu in si obdan s proučevanim območjem ter lokalnimi prebivalci in deležniki, je različne ideje lažje preizkusiti in oblikovati. Poleg tega so se z isto problematiko ukvarjali različni profili bodočih strokovnjakov z različnih področij. Ker jim je skupno, da se ukvarjajo s prostorom, je sodelovanje in interdisciplinarnost na tej točki še dodatna izkušnja, ki so jo na delavnici uspešno preizkusili.

ABSTRACT

The workshop's main goal was to involve students in a real-life project within Istra (Istria), an area of Slovenia that faces several social, economic, and planning problems. The workshop was divided into three phases: the preparation phase – the analysis of the area using statistical data, the field work phase and, finally, the dissemination phase – preparation of results, writing articles, and publishing a book. At the beginning of the field work phase, the students were given an input of the wider area framework, where the mentors presented both physical and social aspects of the area. They were introduced to the local life through several lectures of various local stakeholders (representatives of local initiatives, inhabitants, head of regional development agency, etc.). They were also a good source of information about the daily local life and routines. The students were then divided into mixed interdisciplinary groups, consisting of an architect, a planner, and a landscape architect. Finally, the workshop results were presented as posters at the end of the workshop. The whole process was disseminated in a book that is published on-line and freely available.

STANFORD, TEČAJ GLOBALNEGA TIMSKEGA DELA AEC 2015
STANFORD, AEC GLOBAL TEAMWORK COURSE 2015

ZDA, virtualno sodelovanje

2014/2015

TIP DELAVNICE *TYPE OF WORKSHOP*
interdisciplinarna arhitekturna delavnica/ mednarodna delavnica

MENTORJI *MENTORS*
Super-Coach and Mentor: Renate Fruchter, Stanford University; Architects – Industry: David Bendet, HDR Inc., Kristian Fosholt, Perkins+Will, Willem Kymmell, CSU Chico, Hans Verheij, NACO, Wafaa Sabil, Swinerton Builders, Friedrich Traub, Hanover, Germany; Faculty: Mike Martin, UC Berkeley, Humberto Cavallin, University of Puerto Rico, Willem Kymmel, UCS Chico, Michael Mullins, AAU, Denmark, Michael Lauring, AAU, Denmark, Gitte Sorensen, Copenhagen, Denmark, Jan Slyk, WUoT, Poland, Anja Jutraz, University of Ljubljana, Slovenia, Saija Hollmen, Aalto University, Finland; Structural Engineers – Industry: Greg Luth, GPLA, Shilin Young, GPLA, Tim Schrotenboer,GPLA, Erik Kneer, Holmes Sculley, Geoff Bomba, Forell/ Elsesser, Eric Borchers, ARUP, Nick Arenson, Consultant, Guido Morgenthal, Bauhaus University, Frank Scheiber, Bauhaus University, Justin Schwaiger, Thornton Tomasetti, Justin Bocian, Hong Kong, Graham Brasic, Atlanta; Faculty: Eduardo Miranda, Stanford University, Ronnie Borja, Stanford University, David Borowicz, USMA West Point, Charles Quagliana, UW Madison; MEP – Industry: Cole Roberts, ARUP, Afaan Naqvi, ARUP, Kyle Adams, ARUP, Luis Rivera, ARUP; Faculty: Michael Lepech, Stanford University, Sarah Russell-Smith, Stanford University, John Nelson, UW Madison, Lotte Bjerregaard Jensen, DTU, Denmark, Jan Karlshoj, DTU, Denmark, Annika Feige, ETH Zurich; CM – Industry: Adhamina Rodriguez, Swinerton Builders, Henry Tooryani, Microestimating Inc., Mark Bartlett, Hunt construction, Dan Gonzales, Design Village, Fernando Castillo Cohen, DPR, Dustin Rothwell, DPR, Mike Miller, DPR, Michael Pearson, DPR, Maria Selk, Mortensen Construction, Julian Nahan, BECK Group, Forest Olaf Peterson, Stanford University, Lauren Scammell, ARUP, Plamen Ivanov, Clark Construction, Ramprasath Palanisamy, Bechtel, Diana Louie, Webcor, Matt Larson, Webcor, Enrique Hernandez, Fluor, Josh Odelson, Power Construction; Faculty: Martin Fischer, Stanford University, Bob Tatum, Stanford University, Tomo Cerovsek, University of Ljubljana, Slovenia, Martin Lah, University of Ljubljana, Slovenia, Vaino Terandi, KTH, Sweden; LCFM – Industry: Matthias Ehrlich, CAPGEMINI, Axel Seifert, LA; Faculty: Hans Wilhelm Alfen, Bauhaus University, Germany, Bjorn Wuendsch, Bauhaus University, Germany, Norayr Badasyan, Bauhaus University, Germany, Tim Tarek Fergin, Bauhaus University, Germany, Maria Frank, Stanford University

ORGANIZATOR *ORGANISATION*
Stanford University, PBL Lab, prof.dr. Renate Fruchter

DATUM IN KRAJ RAZSTAVE *DATE AND LOCATION OF EXHIBITION*
Spletna stran projekta in rezultatov: www.pbl.si in http://pbl.stanford.edu/

GRADIVO PRIPRAVILA *MATERIALS PREPARED BY*
asist.dr. Anja Jutraž, prof.dr. Tadeja Zupančič

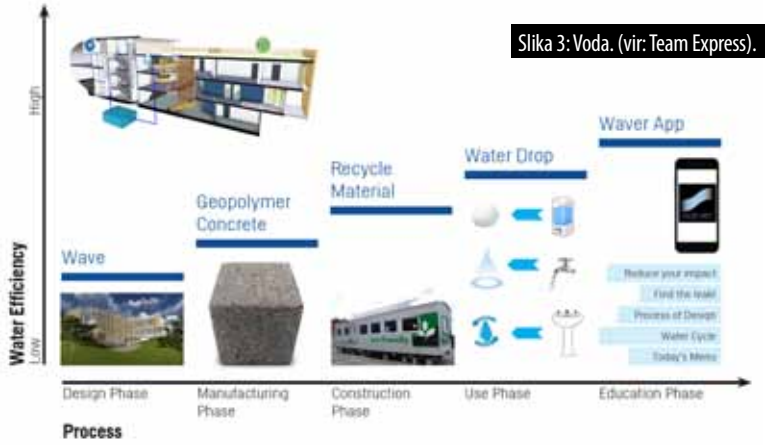
Slika 1: Skupina Express na Univerzi Stanford (foto: Team Express).

ŠTUDENTJE *STUDENTS*
Architects: Martin Legaard Hansen, Robert Kardinar, Stephanie Mulero, Aleksandra Sobczyk, Ana Villamizar, Katia Virta, Borys Wesołowski; Structural Engineers: Gaoxi Dai, Robert Hartung, Steve Herzog, Ana Kragelj, Jia Li, Jiacheng Li, Sio-Chong Lo, Luke Lombardi, Adam Pękala, Thomas Trinelle, Meng Wang, Jie Wu, Liu Xi; Construction Managers: Klara Alias, Han Wei Chew, Ryan Coakley, Benjamin Cohen, Daniel Cohen, Nejc Filipič, Catrin Marcellina, Carlo Markmeyer, Hussain Parsianfar, Tyler Zastrow, Nick Zeman; Life-Cycle Financial Managers: Elisa Braune, Christopher Görsch, Janine Schluer; MEP: Andrew Gong, Adrienne Johnson, Ali Kucukavci, Stavros Moiragias, Marie Rugholm Nielsen, Marios Tsikos; Apprentice: Arianna Heiderer, Kelsey Lange, Geffen Oren, Marveliz Santos.

DRUGI SODELUJOČI
Sodelujoče univerze: Stanford University; University of Ljubljana, Bauhaus – Universitat Weimar; KTH, Sweden; University of Wisconsin – Madison; University of Puerto Rico; Aalto University, School of Arts, Design and Architecture; Berkeley University of California; California State University – Chico; TU Delft; Aalborg University; Danmarks Tekniske Universitat; The Royal Danish Academy of Fine Arts, School of Architecture; Politechnika Warszawska; University Collage Cork; ETH Zurich.
Vodje skupin/ Owners: Anja Jutraz, Norayr Badasyan, Felix Bollwahn, Mandy Bugzel, Jure Česnik, Ana Sofia Cardona, Fernando Castillo, Dorian Curcanu, Flavia Grey, Maria Frank, Enrique F Hernandez, Jackie Jiao, Andrej Kurent, Ethan Landy, Mike Miller, Bianca Morell, Michael J. Muller, Karolina Ostrowska, Anirudh Rao, Sarah Saxon, Kourosh Salehzadeh, Michael Christopher Seaman, Maria Selk, Jana Unterschütz, Pawel Wolejsza

Žirija: 9th Swinerton Sustainability Challenge (WATER): Adhamina Rodriguez (Swinerton Builders); 6th DPR IPD Challenge (LATENCY): Atul Khanzode and Dean Reed (DPR Construction)

Slika 2: Projekt. (vir: Team Express).



Slika 3: Voda. (vir: Team Express).

VSEBINA

Pri virtualni delavnici, z dvema kratkima srečanjima na Univerzi Stanford na začetku in ob koncu projekta (januarja in maja 2015), so sodelovali študentje in mentorji iz vsega sveta. Sodelovalo je 7 arhitektov, 13 statikov, 11vodij gradbišča, 3 LCFM, 6 strojnikov in 4 pripravniki. Hkrati je sodelovalo 26 t.i. investitorjev ter številni univerzitetni mentorji in mentorji iz industrije (Perkins+Will, NACO, Swinerton Builders, ARUP, GPLA, DPR, Bechtel, Webor idr.). Študentje so v šestih interdisciplinarnih skupinah izdelali projekt javne skladbe, v katerem so preizkušali nove tehnološke rešitve in raziskovali inovativne koncepte učenja in zasnove fakultet. Poseben poudarek so posvečali reševanju dveh iziovov, voda in latentnost ("water & latency").

ABSTRACT

The topic of 22nd AEC Global Teamwork course was "AEC TeamGym: Product, Process, and Performance Accelerators". Students focused on two challenges: Water and Latency. Adamina Rodrigues from Sustainable Builders desribed water challenge: »Rivers, Lakes, and Aquifers are drying up or are becoming too polluted to use... Will your building be another offender or a solution?«, and Dean Reed described latency challenge: »Find a simple, quick and accurate way to measure latency, within global teams, reduce it within your team, and propose a KPI for AEC global teams.« The focus of the course was not only the final project, but also the process (what students learnt on the journey). The main idea of the course was to explore, try different solutions, and make a research on both challenges. Students learnt a lot about communication and collaboration and nevertheless a lot about themselves and how they operate in the team.

VIRTUALNA DELAVNICA SLOVENIA – PUERTO RICO 2015
COLLABORATIVE STUDIO SLOVENIA – PUERTO RICO 2015

Puerto Rico/Slovenija, virtualno sodelovanje

2014/2015

TIP DELAVNICE *TYPE OF WORKSHOP*
mednarodna arhitekturna virtualna delavnica

MENTORJI *MENTORS*
Univerza v Ljubljani, Fakulteta za arhitekturo: asist.dr. Anja Jutraž, prof.dr. Tadeja Zupančič; Univerza v Puerto Ricu, Fakulteta za arhitekturo: prof. Robin Planas Casado, prof.dr. Humberto Cavallin, prof. Blanquita Calzada; Tehnični sodelavci: Sanja Štimac, Robert Kardinar (Univerza v Ljubljani, Fakulteta za arhitekturo).
ŠTUDENTJE *STUDENTS*
Group 01, SLO site, UNDECIDED: Paola González Márquez, Gabriela Calzada (UPR, School of Architecture), L. Carlos Martínez Gómez, Simon Lušin (UL, Faculty of Architecture); Group 02, SLO site, COLDLAKE: Osvaldo Delbrey, Kenismael Santiago (UPR, School of Architecture), L. Carlos Martínez Gómez, Simon Lušin (UL, Faculty of Architecture); Group 03, SLO site, VALE--DALE: Margaret Sobrino, Fernando Claudio (UPR, School of Architecture), Adrian Porto, Macarena Fernández (UL, Faculty of Architecture); Group 04, PR site, BANANAS: Daniel Sanchez, Fiamma Seda (UPR, School of Architecture), Diego Umari, Egle Valikonyte, Lorea Diaz Gutierrez (UL, Faculty of Architecture); Group 05, PR site, BONNIES'N'CLYDE: Gabriela Enid Dávila, Ilian Pérez, Claudia Patricia Gerena (UPR, School of Architecture), Rok Sojer, Tringe Latifi (UL, Faculty of Architecture); Group 06, PR site, CONNECTIONS: Carmen I Ruiz, Cesar A Del Valle Rolón (UPR, School of Architecture), Sara Lavtar, Zala Kosnik (UL, Faculty of Architecture)

ORGANIZATOR *ORGANISATION*
University of Ljubljana, Faculty of Architecture; University of Puerto Rico, School of Architecture.

DRUGI SODELUJOČI *OTHER PARTICIPANTS*
Občina Dobrovnik.

GRADIVO PRIPRAVILA *MATERIALS PREPARED BY*
asist.dr. Anja Jutraž, prof.dr. Tadeja Zupančič

Slika 1: Študentje iz Puerto Rica (zgoraj) in iz Slovenije (spodaj). foto: CS SLO-PR.

Slika 2: Lokacija v Sloveniji in v Puerto Ricu. foto: CS SLO-PR.

Slika 3: Virtualno sodelovanje. foto: CS SLO-PR.

VSEBINA

Virtualna delavnica "Collaborative Studio Slovenia – Puerto Rico" je v šolskem letu 2014/2015 potekala že tretje leto, glavni namen delavnice pa je bil študentom pokazati različne tehnike in digitalna orodja za delo na daljavo. Delavnica je potekala med Univerzo v Ljubljani, Fakulteto za arhitekturo ter Univerzo v Puerto Ricu, Fakulteto za arhitekturo. Šest mešanih skupin (2 študenta iz Ljubljane in 2 študenta iz Puerto Rica) je pet tednov sodelovalo na daljavo, pri čemer so uporabljali Skype, GoToMeeting, GoogleHangout, Dropbox, Box in druga orodja. Študentom smo pokazali različna orodja in jih spodbujali, da raziskujejo in uporabljajo tisto, ki jim najbolj ustreza za delo na daljavo. Poseben izziv jim je predstavljalo tudi delo s študenti iz drugega kulturnega okolja in marsikdaj so se več časa posvečali komunikaciji, prenosu ideje iz ene strani oceana na drugo stran kot pa samemu razvoju projekta. Različni pogledi na arhitekturo so jih vodili do sprejemanja kompromisov, hkrati pa jim je to odpiralo obzorje. Cilj projekta je bilo raziskovanje različnih variant, sodelovanje na daljavo in lahko rečemo, da je bil sam proces pomembnejši kot končni produkt.

Tema delavnice "Collaborative Studio Slovenia – Puerto Rico 2015" so bila jezera, in sicer sta bili izbrani dve podobni lokaciji, ena v Sloveniji in ena v Puerto Ricu: Bukovniško jezero in Lake Dos Bocas. V prvem delu so morali študentje predlagati novo urbanistično ureditev (ureditev širšega območja okoli jezera, poti, dostopov, umestitev objekta na lokacijo idr.), v drugem delu pa so morali na izbrani lokaciji postaviti nov objekt za obiskovalce (s knjižnico, barom, info točko, predavalnico idr.).

ABSTRACT

The main idea of Collaborative studio Slovenia-Puerto Rico is the collaboration between two universities (University of Ljubljana and University of Puerto Rico) from different cultural environments and educational curricula, where distinct local architecture and natural constraints may be identified. It is an international interaction and cross-cultural exchange of knowledge and experience. Students collaborate through long-distance communication only without any f2f meetings. Participants share their different background knowledge and design principles, while working to design a building in another cultural environment. In 2015, cooperation was held for the third year. The topic was visitor center near the lake, where one lake was located in Puerto Rico (Lago Dos Bocas) and another in Slovenia (Bukovniško lake near Dobrovnik).

ŠTUDENTKA DELAVNICA 2014: LOG POD MANGARTOM PO DROBIRSKEM TOKU 2000

2014 STUDENT WORKSHOP: LOG POD MANGRTOM AFTER THE 2000 DEBRIS FLOW

Log pod Mangrtom

2014

TIP DELAVNICE *TYPE OF WORKSHOP*
prostorska delavnica

MENTORJI *MENTORS*
prof. dr. matjaž Mikoš, UL FGG; doc. dr. Alma Zavodnik Lamovšek, UL FGG; mag. Aleš Golja, UL FGG; asist. Gašper Mrak, UL FGG

ŠTUDENTJE *STUDENTS*
Magistrski študijski program Prostorsko načrtovanje (UL Fakulteta za gradbeništvo in geodezijo): Miha Bevcer, Špela Blatnik, Katarina Čirič, Anita Ferlin, Davor Grabar, Suzana Kužatko, Gašper Okršlar, Ana Plavčak, Matej Plešej, Nika Podbevšek, Eva Primožič, Irena Rojko, Maja Weisseisen;

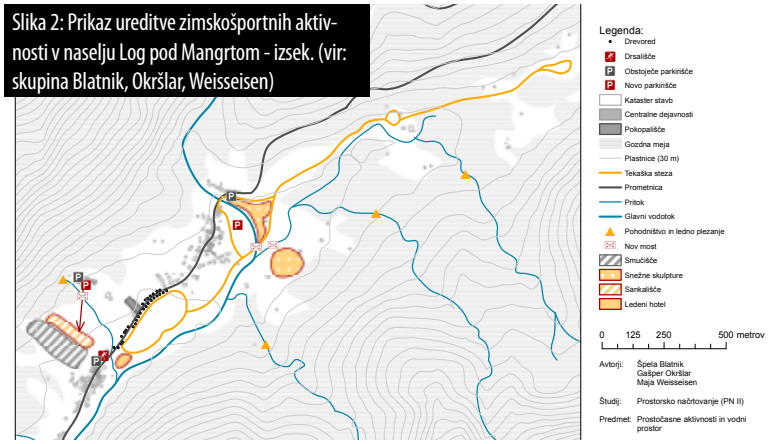
INSTITUCIJE *INSTITUTIONS*
UL Fakulteta za gradbeništvo in geodezijo,

ORGANIZATORJA *ORGANISATION*
Univerza v Ljubljani, Fakulteta za gradbeništvo in geodezijo

GRADIVO PRIPRAVILA *MATERIALS PREPARED BY*
Gašper Okršlar, Maja Weisseisen

Delavnica se je izvajala v sklopu Projekta ARRS J6-6853 – Prožnost alpskih pokrajin z vidika naravnih nesreč

Slika 1: Ogled območja in ukrepov, ki so bili izvedeni po sanaciji (foto: Š. Blatnik, 2015).



Slika 2: Prikaz ureditve zimskošportnih aktivnosti v naselju Log pod Mangrtom - izsek. (vir: skupina Blatnik, Okršlar, Weisseisen)

Slika 3: Prikaz predlogov v prostoru (vir: skupina Blatnik, Okršlar, Weisseisen)

VSEBINA

Turizem je tesno povezan z rabo prostora in izkoriščanjem njegovih potencialov, zato smo se študenti magistrskega študija prostorskega načrtovanja Fakultete za gradbeništvo in geodezijo v okviru več dnevne delavnice ukvarjali s problematiko razvoja turizma v Logu pod Mangartom in v širši okolici Bovca. Delavnica je bila je bila zastavljena interdisciplinarno, saj smo sodelovali študenti različnih profilov - inženirji gradbeništva, geodezije, gozdarstva in krajinske arhitekture ter geografi. Obravnavano območje zahteva natančno obravnavo in oblikovanje premišljenih rešitev, saj gre za plazovit teren , ki je bil po naravni nesreči jeseni leta 2000 (Zemeljski plaz Stože, pojav drobirskega toka) rekonstruiran. Med drugim je bilo urejeno odvodnjavanje, komunalna infrastruktura, zajetje hidroelektrarne, strugi Predelice in Koritnice, zgrajen je bil razbijač drobirskega toka in zadrževalnik plavin.

Cilji delavnice so z izvedbenega vidika zajemali analizo specifičnega stanja prostora in oblikovanje predlogov za revitalizacijo turistične ponudbe obravnavanega območja, s pedagoškega vidika pa spodbujanje interdisciplinarnega razmišljanja študentov, reševanje konkretnih problemov in celostno obravnavo zastavljene problematike (širok nabor faktorjev, ki lahko vplivajo na razvoj turizma in vključevanje lokalnega prebivalstva).

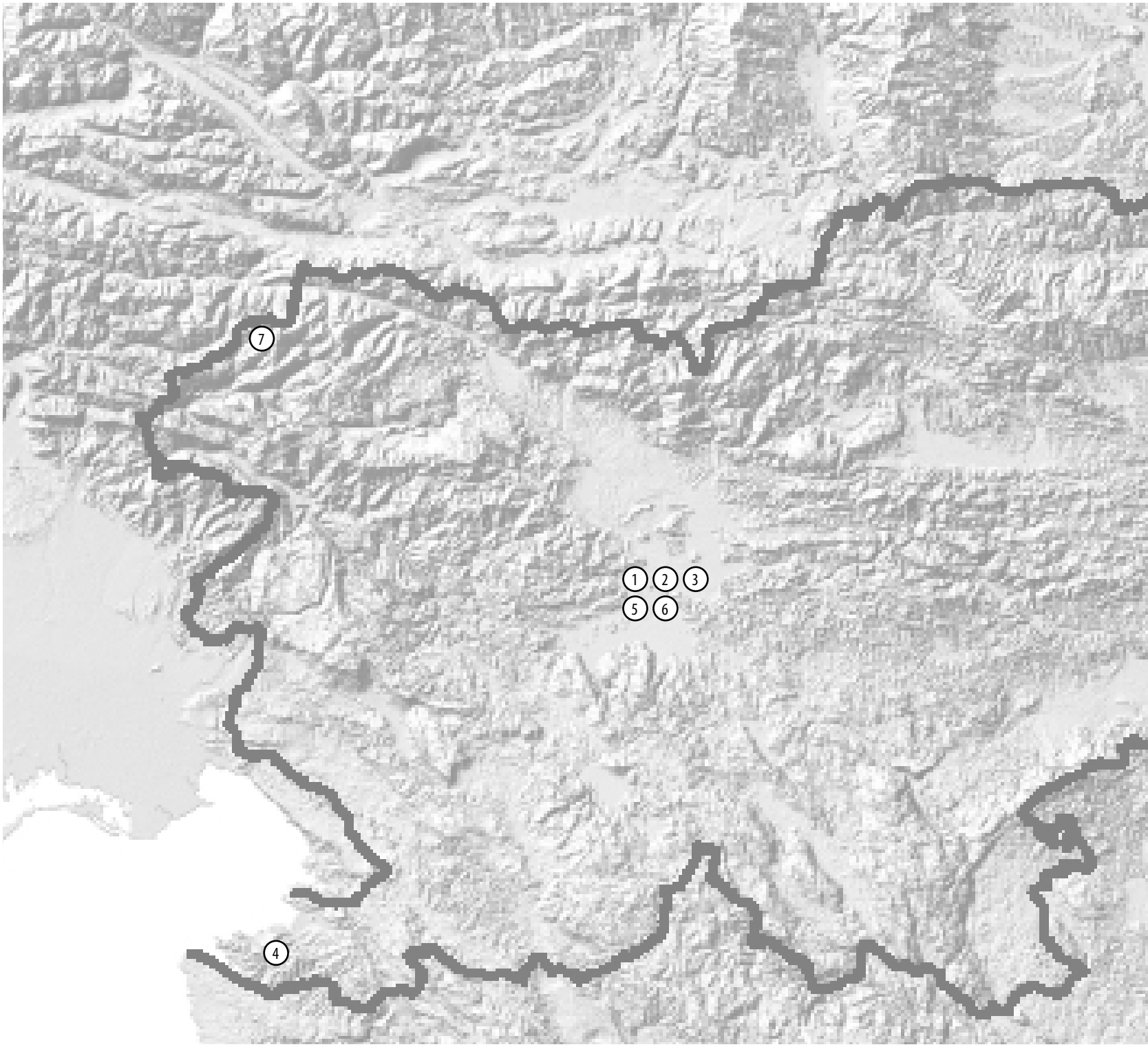
Po opravljenem terenskem delu smo v nadaljevali z oblikovanjem vizij razvoja turizma. Vizije smo grafično predstavili na kartah in plakatih ter jih podrobno opisali v zaključnih poročilih.
Ker je delo potekalo v treh skupinah, smo kot rezultat predstavili tri vizije razvoja: razvoj letnih turističnih aktivnosti, zimskih turističnih aktivnosti in oblikovanje vsebinske predstavitve potencialov Loga pod Mangartom.

Območje Loga pod Mangartom zaradi svoje geografske lege predstavlja idealno okolje za odmik od vsakodnevnega hitrega življenjskega tempa. Za oživitev turistične ponudbe bodo v prihodnosti potrebni posegi, ki bodo obnovili obstoječo ponudbo in jo razširili, da bo primerna širšemu krogu potencialnih uporabnikov. Priložnosti prepoznavamo v edinstvenosti ponudbe, ki ne podvaja obstoječe ponudbe v širši okolici, temveč izkorišča naravne in družbene potenciale prostora. Menimo, da mora ponudba slediti naslednjim trem ugotovitvam:

- ponudba mora biti lokalna (vključevanje prebivalstva – delovna mesta, razvoj),
- izvedljiva v vseh vremenskih pogojih in
- dostopna za vse (prilagojenost za osebe s posebnimi potrebami).

ABSTRACT

The nature of activities is closely related to land use and with smart use of it's potential, that is why the students of master programme in Spatial planning on University of Ljubljana, Faculty of Civil and Geodetic Engineering were engaged in multiday interdisciplinary workshop on tourism development prospects in Log pod Mangrtom, Slovenia. The project area needs a thorough analysis and design of a thought through solutions, since surrounding area landslides prone and a site of major natural disaster event, a debris flow in fall of 2000. The settlement was reconstructed since and had a sizeable landslide measures built and enforced since. The goals of workshop was an assessment of the area, from larger regional perspective down to the common day life in reconstructed settlement.



LOKACIJE DELAVNIC

WORKSHOP LOCATIONS

IV.

PREDSTAVITVE

PRESENTATIONS

2. mednarodna akademska konferenca MESTA IN TEHNOLOGIJE 2015: V korak s sodobnimi tehnologijami do zdravih mest

2nd International Academic Conference PLACES AND TECHNOLOGIES 2015: Keeping up with technologies to make healthy places

Nova Gorica, Slovenija

2015

TIP PREDSTAVITVE *TYPE OF PRESENTATION*
mednarodna znanstvena konferenca/ *international scientific academic conference*

ORGANIZACIJSKI ODBOR *ORGANIZING COMMITTEE*
Dr Eva Vaništa Lazarević, Serbia; Dr Alenka Fikfak, Slovenia;
Dr Milena Vukmirović, Serbia; Prim. Nataša Fikfak, Slovenia;
Dr Aleksandra Krstić - Furundžić, Serbia

ZNANSTVENI ODBOR *SCIENTIFIC COMMITTEE*
Dr Eva Vaništa Lazarević, Serbia; Dr Alenka Fikfak, Slovenia;
Dr Milena Vukmirovic, Serbia; Prim. Nataša Fikfak, Slovenia

ORGANIZATOR *ORGANISATION*
University of Belgrade, Faculty of Architecture, Serbia
University of Ljubljana, Faculty of Architecture, Slovenia
Professional Association, Urban Laboratory, Serbia
General Hospital, »Dr Franca Derganca« Nova Gorica, Slovenia

DATUM IN KRAJ IZVEDBE DOGODKA *DATE AND LOCATION OF THE EVENT*
Konferenca je potekala med dne 18. in 19. junijem 2015 v kongresnem centru, Perla, Nova Gorica, Slovenija.

SPLETNA STRAN *WEB PAGE*
http://www.placesandtechnologies2015.org/

GRADIVO PRIPRAVILA *MATERIALS PREPARED BY*
doc. dr. Alenka Fikfak, asist. Gašper Mrak

COBISS *Slovene Co-operative Online Bibliographic System and Services*

FIKFAK, Alenka (urednik), VANIŠTA LAZAREVIĆ, Eva (urednik), FIKFAK, Nataša (urednik), VUKMIROVIČ, Milena (urednik), GABRIJELČIČ, Peter (urednik). Keeping up with technologies to make healthy places: book of conference abstracts. Ljubljana: Faculty of Architecture, 2015. 168 str. ISBN 978-961-6823-67-8. [COBISS.SI-ID 279983872]

FIKFAK, Alenka (urednik), VANIŠTA LAZAREVIĆ, Eva (urednik), FIKFAK, Nataša (urednik), VUKMIROVIČ, Milena (urednik), GABRIJELČIČ, Peter (urednik). Keeping up with technologies to make healthy places : book of conference proceedings. Ljubljana: Faculty of Architecture, 2015. 1 optični disk (CD-ROM), ilustr. ISBN 978-961-6823-68-5. [COBISS.SI-ID 279986432]

FIKFAK, Alenka (urednik) et. al. Keeping up with technologies to make healthy places : book of conference ab-stracts. Ljubljana: Faculty of Architecture, 2015. ISBN 978-961-6823-70-8. http://www.fa.uni-lj.si/filelib/obvestila/2015/book_of_abstracts_pu2015_web.pdf. [COBISS.SI-ID 280265728]

FIKFAK, Alenka (urednik) et. al. Keeping up with technologies to make healthy places : book of conference pro-ceedings. Ljubljana: Faculty of Architecture, 2015. ISBN 978-961-6823-71-5. http://www.fa.uni-lj.si/filelib/obvestila/2015/book_of_proceedings_pu2015.pdf. [COBISS.SI-ID 280266240]

VSEBINA

Cilj konference je bila predstavitev, diskusija in spodbujanje oblikovanja novih znanj ter zamisli o tehnologijah in okolju kot tudi preučitev etičnih vidikov in morebitnih tveganj, razvojnih rešitev, strokovnega znanja ter spodbujanje razprav v povezavi z enim od najpomembnejših strateških vprašanj – javnim zdravjem. Navedeni cilj je izpostavil nujnost multidisciplinarnega pristopa k tej temi ter prepoznavanje in vzpostavitev odnosov med vprašanji tehnološkega razvoja, varstva okolja in družbenih sprememb. Program konference je vključeval raziskave, ki so temeljile na poznavanju različnih akademskih ved: inženirskih in tehničnih ved, medicinskih ved ter humanističnih in družbenih ved.

ABSTRACT

The conference has examined the formation and presentation of knowledge on technologies and the environ-ment, as well as ethical considerations and potential risks, developing solutions, expertise and discussions with respect to one of the most important strategic issues – public health. The stated objective point to the necessity of a multidis¬ciplinary approach to this matter, identification and establishment of relationships between issues of technological development, environmental protection and social change. Consequently the conference pro-gram and research were based on the knowledge of several academic disciplines: engineering and technical sciences, medical sciences, hu¬manities and social sciences.

The main tasks of the conference were defined in order to discuss the issues related to:
(1) the future of society and places,
(2) design of healthy places, facilities and infrastructure in line with needs of inhabitants,
(3) development of institutions and regulations with an aim of creating healthy-supportive environment, and
(4) creation of favorable conditions for the advancement of innovation and business to achieve a good quality of life.

Having in mind the conference goals and objectives the focus was on research and understand from the critical aspect the importance and role of technology in design and creation of healthy places through:
(1) built environment perspective,
(2) medical perspective,
(3) technological perspective,
(4) government perspective,
(5) social perspective.

TOPICS
(1.) Architecture and Health
(2.) Physical Planning and Quality of Place
(3.) Lifetime Communities and Participation
(4.) Cultural Patterns and Sensitivity
(5.) Health Intensive Care
(6.) Inclusive and accessible environment
(7.) Environmental Friendly Transport
(8.) Building Technologies
(9.) Adaptive Reuse and Urban Renewal
(10.) Active Living and Health
(11.) Health Promotion, Protection and Prevention

Other data available on: *http://www.placesandtechnologies2015.org*

Slika 1: 18.6.2015, Session 1_ ARCHITECTURE AND MEDICINE FOR TOMORROW, lecture by prof. Stephan MAEDER (Urška Kalčič).

Slika 2: 18.6.2015, invited guests and organisers: rector Prof. Dr Danilo Zavrtanik, University of Nova Gorica, Slovenia; Assoc. Prof. Dr Florian Nepravishta (Direktor departement), Department of Architecture at Polytechnic University of Tirana, Albania; Dr Eva Vaništa Lazarević, Conference Director, University of Belgrade, Faculty of Architecture, Serbia; Prof. MSc Peter Gabrijelčič, University of Ljubljana, Faculty of Architecture, Slovenia (from left to right) (Urška Kalčič).

Slika 3: 18.6.2015, Session 2_HEALTHY PLACES – FROM VISIONS TO PRACTICES, lesson by MSc Peter GABRIJELČIČ (Urška Kalčič).

V.

PROJEKTI

PROJECTS

RAZISKOVANJE PROCESA MANAGEMENTA: POTENCIAL TRŽENJA TRAJNOSTNEGA TURIZMA V LJUBLJANI

MANAGEMENT PROCESS RESEARCH: MARKETING POTENTIAL OF SUSTAINABLE TOURISM IN LJUBLJANA

Ljubljana

2014/2015

TIP DELAVNICE *TYPE OF WORKSHOP*
prikaz managementa trajnostnega turizma v prestolnici prek družbene inovacije/slovenska

MENTORJI *MENTORS*
doc. dr. Judita Peterlin; prof. dr. Vlado Dimovski; doc. dr. Domen Zupančič, prof. dr. Alenka Pavko Čuden, Alenka Repič

ŠTUDENTJE *STUDENTS*
UL Ekonomska fakulteta: Anja Čelik, Meta Pezdir, Jernej Tomazin, Julija Črepinšek, Erik Kranjc, Pia Milić, Tina Končan; UL Fakulteta za arhitekturo: Stefani Berginc, Sandra Stare; UL Naravoslovnotehniška fakulteta: Tanja Furlan

DRUGI SODELUJOČI *OTHER PARTICIPANTS*
podjetje Kaaita: Alenka Repič, direktorica, Kaaita, d.o.o., Prikrnica 14, 1251 Moravče

NAROČNIK
Evropski socialni sklad, Javni sklad RS za razvoj kadrov in štipendije

DATUM IN KRAJ RAZSTAVE *DATE AND LOCATION OF EXHIBITION*
Ljubljana, 1. 10. 2015, Javni sklad RS za razvoj kadrov in štipendije

GRADIVO PRIPRAVILA *MATERIALS PREPARED BY*
doc. dr. Judita Peterlin, prof. dr. Vlado Dimovski, doc. dr. Domen Zupančič, prof. dr. Alenka Pavko Čuden, Alenka Repič

Univerza v Ljubljani

Naložba v vašo prihodnost
Operacijo delno financira Evropska unija
Evropski socialni sklad

JAVNI SKLAD REPUBLIKE SLOVENIJE ZA RAZVOJ KADROV IN ŠTIPENDIJE

REPUBLIKA SLOVENIJA
MINISTRSTVO ZA IZOBRAŽEVANJE, ZNANOST IN ŠPORT

»Projekt delno financira Evropska unija, in sicer iz Evropskega socialnega sklada. Projekt se izvaja v okviru Operativnega programa razvoja človeških virov za obdobje 2007–2013, 1. razvojne prioritete »Spodbujanje podjetništva in prilagodljivosti« ter prednostne usmeritve 1.3. »Štipendijske sheme«, v okviru potrjene operacije »Po kreativni poti do praktičnega znanja«.

COBISS_Slovene Co-operative Online Bibliographic System and Services oz. ustrezen podatek o vpisu v drugo bibliografsko bazo
PETERLIN, Judita, DIMOVSKI, Vlado. Innovation of new knowledge in sustainable tourism through social innovation. V: Enterprise, Research, Innovation Conference, Kotor, Montenegro, September 10-11, 2015. [nagrajen konferenčni prispevek]. BAĆOVIĆ, Maja (ur.). Proceedings of the ENTRENOVA '15. Zagreb: Udruga za promicanje inovacija i istraživanja u ekonomiji »IRENET«, 2015, str. 505-511. [COBISS. SI-ID 22751974]

Slika 1: Predstavitev modela trajnostnega turizma Zmajeva pot na okrogli mizi strokovni javnosti (avtorica: Judita Peterlin).

Slika 2: Komentar modela trajnostnega turizma Pristni okusi Slovenije, avtorica: Judita Peterlin˝.

Slika 3: Identifikacija zmajev po Ljubljani – terenska analiza na podlagi vodenega ogleda, ki ga je vodil doc. dr. Domen Zupančič (avtorica: Judita Peterlin).

Slika 4: Vizualizacija projektnih modelov, avtor: Domen Zupančič.

VSEBINA

Reševali smo problematiko trajnostnega turizma z uvedbo procesa družbene inovacije. Preučili smo literaturo s področij managementa, trajnostnega turizma, trženja in arhitekture. Opolnomočeni študentje so na osnovi seznanjenosti s teorijo mnogoterih inteligentnosti in ustvarjalnih tehnik izvedli 326 vprašalnikov družbene inovacije na terenu in na podlagi benchmarkinga ter potreb trga pripravili okvirne smernice za razvoj modela trajnostnega turizma v Ljubljani. Študentje so modelno in prototipno opredmetili tri idejne rešitve managementa trajnostnega turizma prek družbene inovacije: (1) Zmajeva pot, (2) Prenova železniške postaje in (3) Pristni okusi Slovenije. Turizem Ljubljana je izrazil zanimanje za udejanjanje Zmajeve poti, ki se razvija naprej. Zaradi osredotočenja na oblikovanje sodobne turistične doživljajske ponudbe, izdelane v sodelovanju med lokalnim prebivalstvom Ljubljane ter interdisciplinarno zasedbo študentov smo identificirali trajnostno turistične modele - nove poslovne priložnosti za Ljubljančane, sodelujoče dobavitelje in rokodelce po Sloveniji. Identificirali smo potencial oblikovanja turistične ponudbe v obliki izdelkov in storitev, ki izhajajo iz lokalnih potencialov, resursov in dediščine - na način samoorganizacije in aktivacije lokalnega prebivalstva. Podjetje Kaaita, d.o.o., je pridobilo vpogled v potrebe lokalne skupnosti prek družbene inovacije, možnosti zasnove in distribucije svojih izdelkov v okviru trajnostnega turizma v Ljubljani. Pri študentih pa smo razvili spretnosti interakcije, analize podatkov in komunikacijske spretnosti s člani interdisciplinarnega tima in deležnikov trajnostnega turizma v Ljubljani.

ABSTRACT

We were solving the problem of sustainable tourism with the introduction of the process of social innovation. We examined the relevant literature in the fields of management, marketing, architecture and sustainable tourism. Students' models and prototypes concretised three conceptual solutions for the management of sustainable tourism through social innovation: (1) Dragon path; (2) Renovation of the railway station and (3) Authentic taste of Slovenia. We identified the potential for the creation of the tourist offer in the form of products and services derived from local potentials, resources and heritage - in a manner of sustainable self-organization networks and empowerment of local population.

NAČRTOVANJE KOLESARSKE IN SPREHAJALNE POTI V OBČINI ŠENTRUPERT

PLANNING OF BICYCLE AND PEDESTRIAN PATH IN THE MUNICIPALITY OF ŠENTRUPERT

Šentrupert

2015

TIP DELAVNICE *TYPE OF WORKSHOP*
/slovenska

MENTORJI *MENTORS*
doc. dr. Alma Zavodnik Lamovšek, izr. prof. dr. Andreja Cirman, dr. Iztok Kovačič, Judita Thaler

ŠTUDENTJE *STUDENTS*
UL Fakulteta za gradbeništvo in geodezijo: Miha Bevcer, Simon Lesjak, Eva Primožič, Irena Rojko, Rok Urbanija; UL Ekonomska fakulteta: Neža Pagon; UL, Fakulteta za arhitekturo: Kristina Capuder, Jure Hafnar; UL Biotehniška fakulteta: Ana Pagon

DRUGI SODELUJOČI *OTHER PARTICIPANTS*
Občina Šentrupert
Urbi d.o.o., oblikovanje prostora

NAROČNIK
Evropski socialni sklad, Javni sklad RS za razvoj kadrov in štipendije

DATUM IN KRAJ RAZSTAVE *DATE AND LOCATION OF EXHIBITION*
1. 10. 2015, Ljubljana, Javni sklad RS za razvoj kadrov in štipendije
15. 10. 2015 , Ljubljana, UL, Fakulteta za gradbeništvo in geodezijo,

GRADIVO PRIPRAVILA *MATERIALS PREPARED BY*
Irena Rojko

»Projekt delno financira Evropska unija, in sicer iz Evropskega socialnega sklada. Projekt se izvaja v okviru Operativnega programa razvoja človeških virov za obdobje 2007–2013, 1. razvojne prioritete »Spodbujanje podjetništva in prilagodljivosti« ter prednostne usmeritve 1.3. »Štipendijske sheme«, v okviru potrjene operacije »Po kreativni poti do praktičnega znanja«.

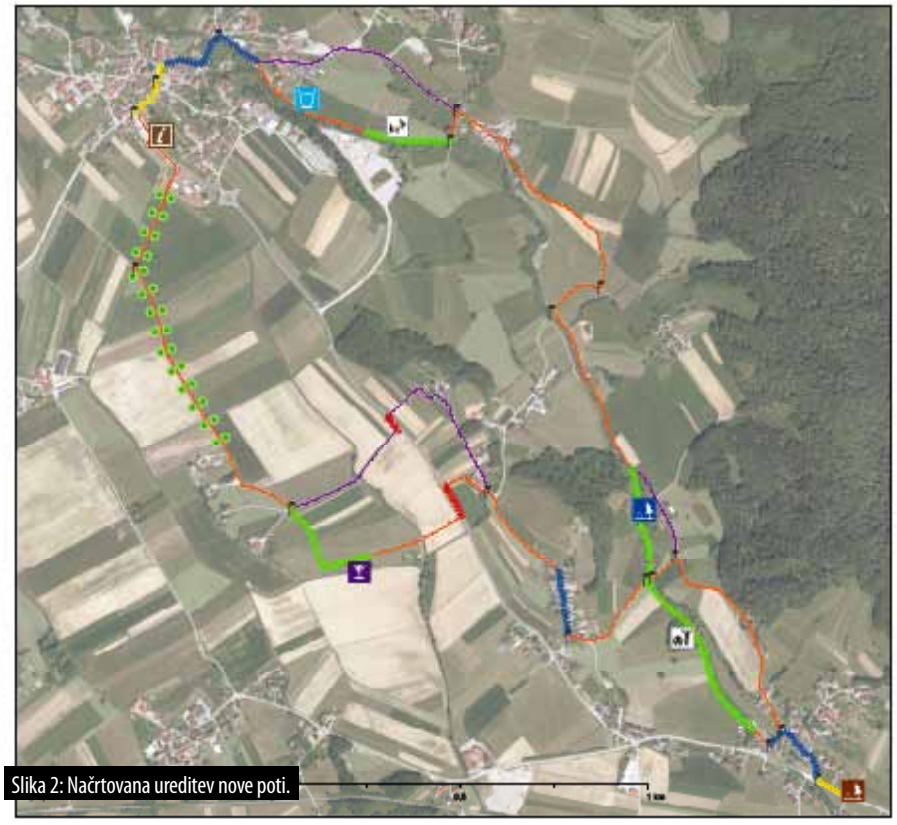
VSEBINA

V Občini Šentrupert se nahaja Simončičev toplar, ki je kot eden največjih in najlepših toplarjev razglašen za državni spomenik kulturne dediščine. Od središča Šentruperta, kjer se nahaja z njim tesno povezana Dežela kozolcev, je Simončičev toplar oddaljen več kot dva kilometra. Na tej relaciji še ni urejene kolesarske in peš poti, ki bi obe lokaciji povezala in tako prispevala k večji privlačnosti tega območja za obiskovalce. V Šentrupertu pogrešajo tudi varno rekreacijsko pot, ki bi lahko služila kot varna pot v šolo in hkrati za sprehode in druge načine rekreacije domačinov.

Osrednja tema projekta je bila vzpostavitev nove krožne povezave med Deželo kozolcev in Simončičevim toplarjem, glavna naloga interdisciplinarne skupine študentov pa je bila prostorsko umestiti novo pot, ki bo zadostila potrebam ne le Šentrupertčanov temveč tudi obiskovalcev tega območja. Preučili smo prostorske potenciale, potrebe in priložnosti na območju Občine Šentrupert, izvedli smo prostorsko delavnico z lokalnimi prebivalci, kjer smo pridobili mnenja in predloge prebivalcev za umestitev nove poti (Slika 1). Določili smo optimalen potek nove poti in ureditve (Slika 2), ki so upoštevale mnenje in predloge lokalnega prebivalstva prav tako pa so, glede na opravljene strokovne analize, ustrezene.

Z rezultati projekta smo zadovoljni, najbolj pomembno pa je, da so z njimi zadovoljni tudi prebivalci Šentruperta. Želimo si, da bi do implementacije projekta prišlo kmalu in bi tako nova pot zaživela v prostoru.

Slika 1: Razprava na prostorski delavnici (Vir: Eva Primožič).



Slika 2: Načrtovana ureditev nove poti.

ABSTRACT

Municipality of Šentrupert takes pride in their Simončičev toplar double hayrack, which is a national cultural heritage monument. As it is preserved in-situ, Simončičev toplar is 2 kilometres separated from its counterpart Land of hayracks in Šentrupert center. There is no proper pedestrian connection between those two tourist attractions and there is also lack of a safe pedestrian/bicycle connection throughout Šentrupert. The goal of this project was to plan the new circular path across the Šentrupert area, connecting Simončičev toplar with Land of hayracks, thus providing the long-needed recreational path for locals and tourists. The project team has considered the opinion of citizens of Šentrupert and produced the results based on many different analyses.

INOVATIVNI PRISTOPI IZDELAVE PRIKAZOV PROSTORA IN ANALIZA OTROŠKEGA DOJEMANJA LE-TEH
INNOVATIVE APPROACHES TO SPACE PRESENTATIONS AND ANALYSIS OF THEIR COMPREHENSION BY CHILDREN.

Ljubljana, Kostanjevica na Krki, Kranj

2015

TIP DELAVNICE *TYPE OF WORKSHOP*
/slovenska

MENTORJI *MENTORS*
doc. dr. Dušan Petrovič, asist. dr. Klemen Kozmus Trajkovski, asist. dr. Dejan Grigillo, Aleš Lazar uni. dipl. ing. geod., mag. Majda Vehovec

ŠTUDENTJE *STUDENTS*
UL Fakulteta za gradbeništvo in geodezijo: Jernej Nejc Dougan, Aleksander Šašo, Blaž Vidmar, Urh Tržan
Univerza na Primorskem, Pedagoška fakulteta: Ana Ribič, Nastja Glušič

DRUGI SODELUJOČI *OTHER PARTICIPANTS*
3D ATA raziskovalna in razvojna dejavnost na področju naravoslovja in tehnologije d.o.o. (3D ATA d.o.o.)

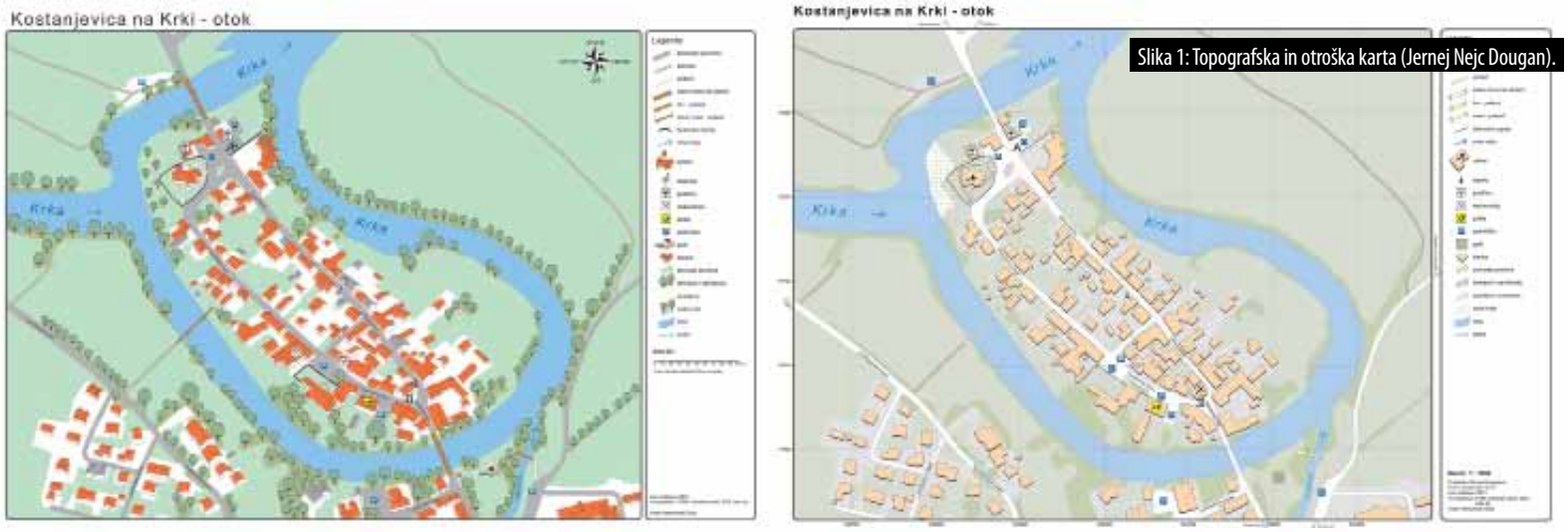
NAROČNIK
Evropski socialni sklad, Javni sklad RS za razvoj kadrov in štipendije

DATUM IN KRAJ RAZSTAVE *DATE AND LOCATION OF EXHIBITION*
1. 10. 2015, Ljubljana, Javni sklad RS za razvoj kadrov in štipendije
15. 10. 2015 , Ljubljana, UL, Fakulteta za gradbeništvo in geodezijo,

GRADIVO PRIPRAVIL *MATERIALS PREPARED BY*
Urh Tržan

Univerza v Ljubljani
Naložba v vašo prihodnost
OPERACIJO DELNO FINANCIRA EVROPSKA UNIJA
Evropski socialni sklad
JAVNI SKLAD REPUBLIKE SLOVENIJE ZA RAZVOJ KADROV IN ŠTIPENDIJE
REPUBLIKA SLOVENIJA
MINISTRSTVO ZA IZOBRAŽEVANJE, ZNANOST IN ŠPORT

»Projekt delno financira Evropska unija, in sicer iz Evropskega socialnega sklada. Projekt se izvaja v okviru Operativnega programa razvoja človeških virov za obdobje 2007–2013, 1. razvojne prioritete »Spodbujanje podjetništva in prilagodljivosti« ter prednostne usmeritve 1.3. »Štipendijske sheme«, v okviru potrjene operacije »Po kreativni poti do praktičnega znanja«.



Slika 1: Topografska in otroška karta (Jernej Nejc Dougan).

Slika 2: 3D karta in maketa (Jernej Nejc Dougan).

VSEBINA

Cilj projekta 'Inovativni pristopi izdelave prikazov prostora in analiza otroškega dojemanja le-teh' je bil izbrano območje prikazati z različnimi pristopi, na različne načine in z uporabo tako klasičnih, kot tudi sodobnih postopkov in tehnologij ter preveriti, kako otroci dojemajo posamezen prikaz oz. kako si na podlagi različnih prikazov predstavljajo nepoznan prostor. Za izdelavo prikazov smo uporabili že obstoječe podatke iz baze Geodetske uprave Republike Slovenije ter podatke, ki smo jih z uporabo lastno izdelanega brezpilotnega letalnika zajeli sami. Izbrano območje prikaza je bil otok Kostanjevica na Krki, načini prikaza pa otroška karta, topografska karta, 3D karta in maketa. Topografska, otroška in 3D karta so bile izdelane v digitalni obliki na podlagi obstoječih podatkov. V končni podobi sta bili topografska in otroška natisnjeni na A1 format v merilu 1:1000, 3D karta pa je za voljo dinamičnega prikaza ostala v interaktivni, digitalni obliki.(slika1). Za izdelavo makete smo na podlagi fotografij, zajetih z letalnikom izdelali digitalni model, ki smo ga nato natisnili s 3D tisalnikom (slika 2).

Različne prikaze smo nato ponudili kot pripomočke k izdelanemu vprašalniku, z le-tem pa smo lahko ocenili uspešnost rešenih nalog pri vseh štirih skupinah petošolcev. Izkazalo se je, da je otrokom najbolj dojemljiva tradicionalna topografska karta, s katero se v učnem procesu že od začetka največkrat srečajo. Sledili sta splošno manj razširjeni maketa in 3D karta, ki pa sta bili s strani otrok, kot tudi učiteljev izbrani za bolj atraktivna prikaza, ki bi se ob pogostejši uporabi po uporabnosti še bolj približali tradicionalnim načinom prikaza.

ABSTRACT

The aim of the project 'Innovative approaches of spatial display and analysis of child perception of it' was to display the selected area with different approaches in different ways and using both traditional as well as modern techniques and technologies and examine how children perceive and understand particular display. Selected area of display was the island of Kostanjevica na Krki and selected approaches were topographic map, childrens map 3D map and 3D printed model of the area. All of the displays were then shown to primery schoolchildreen aged 10 years and they had to answer questions and solve tasks.

OCENA STANJA ŽELEZNIŠKIH JEKLENIH MOSTOV S PREGLEDOM METODOLOGIJ ZA OCENO PREOSTALE ŽIVLJENJSKE DOBE

ASSESSMENT OF STEEL RAILWAY BRIDGES CONDITION AND REVIEW OF METHODOLOGIES FOR ASSESSMENT OF REMAINING LIFETIME.

Ljubljana

2015

TIP DELAVNICE *TYPE OF WORKSHOP*
/slovenska

MENTORJI *MENTORS*
doc. dr. Franc Sinur (FGG), doc. dr. Primož Može (FGG), izr. prof. dr. Jernej Klemenc (FS), prof. dr. Marko Nagode (FS), Leon Hladnik (Razpon d.o.o.), Gregor Gruden (IMK)

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UL Fakulteta za strojništvo: Nejc Demšar, Anže Cvenkek, Gašper Cvenkel;
UL Fakulteta za matematiko in fiziko: Simon Weiss

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DATUM IN KRAJ RAZSTAVE *DATE AND LOCATION OF EXHIBITION*
1. 10. 2015, Ljubljana, Javni sklad RS za razvoj kadrov in štipendije
15. 10. 2015 , Ljubljana, UL, Fakulteta za gradbeništvo in geodezijo,

GRADIVO PRIPRAVIL *MATERIALS PREPARED BY*
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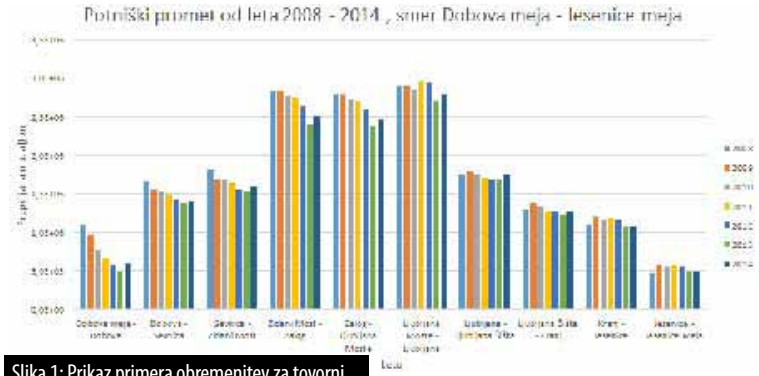
Univerza v Ljubljani
Naložba v vašo prihodnost
OPERACIJO DELNO FINANCIRA EVROPSKA UNIJA
Evropski socialni sklad
JAVNI SKLAD REPUBLIKE SLOVENIJE ZA RAZVOJ KADROV IN ŠTIPENDIJE
REPUBLIKA SLOVENIJA
MINISTRSTVO ZA IZOBRAŽEVANJE, ZNANOST IN ŠPORT

»Projekt delno financira Evropska unija, in sicer iz Evropskega socialnega sklada. Projekt se izvaja v okviru Operativnega programa razvoja človeških virov za obdobje 2007–2013, 1. razvojne prioritete »Spodbujanje podjetništva in prilagodljivosti« ter prednostne usmeritve 1.3. »Štipendijske sheme«, v okviru potrjene operacije »Po kreativni poti do praktičnega znanja«.



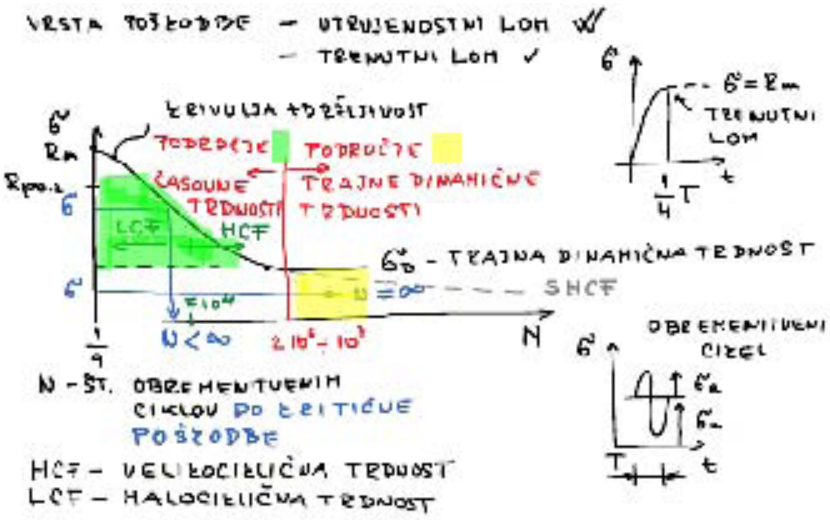
Slika 1: Prikaz primera obremenitev za tovorni promet smer Dobova meja - Jesenice meja.

VSEBINA

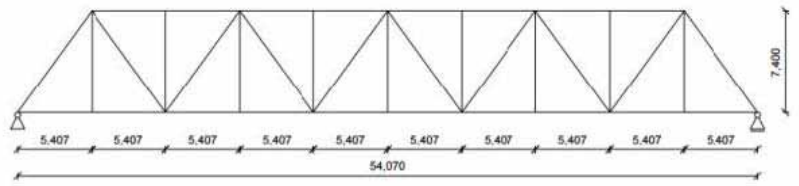
Obravnavana je problematika slovenskega železniškega infrastrukturnega omrežja, kjer smo se osredotočili na analizo jeklenih železniških mostov in oceno njihove preostale življenjske dobe. Analizo smo opravili na podlagi vhodnih podatkov, pridobljenih s strani podjetja Slovenske železnice d.o.o., ki so zajemali podatke od geometrije do podatkov o obremenitvah. Slednji so nam služili za računsko analizo, saj je pri oceni preostale življenjske dobe jeklenih železniških mostov ključno utrujanje jekla, ki pa je povezano s cikli obremenjevanja. Vzpostavila se je spletna baza, v kateri se lahko najdejo osnovni podatki o mostovih ter za določene tudi slike, lokacija in dokumenti v digitalni obliki. Rezultat je bila ocenjena preostala življenjska doba za most čez Savo pri Litiji, ki pa je na podlagi izračunov za nekatere elemente mostu že potekla in sicer zaradi preveč konservativnih vhodnih podatkov o obremenitvah ter zaradi konservativnih predpostavk. Nemogoče je z izračuni natančno določiti preostalo življensko dobo, saj nimamo dovolj točnih podatkov o obremenitvah, potrebna pa bi bila tudi bolj detajlna analiza obnašanja materiala (mehanika loma). Rezultati naših izračunov torej ne povejo natančne življensjske dobe, ampak so odličen pokazatelj, kateri elementi so najbolj izpostavljeni utrujanju ter katerim je potemtakem na pregledu potrebno nameniti največ pozornosti.

ABSTRACT

Problems in Slovenian railway infrastructure system is discussed, where work is focused on analysis of steel railway bridges with estimation of remaining fatigue life. Input data were given by company Slovenske Železnice which includes a pallet of data from geometry to loads per year per section. Loads were used for analysis of remaining life where fatigue of steel is a key problem and connected with cycles of load. Web base were established during a project where basic bridge data, pictures, exact location and digitalized documentation in some cases can also be found. Main result is an estimated remaining fatigue life for bridge over Sava River near Litija, where according to some types of analysis life is already negative. Negative remaining life is the consequence of too conservative input data. Remaining life time is impossible to calculate with sufficient precision because we do not have enough input data of loads and we can not predict the behavior of material. Remaining life time calculations show which elements are most exsposed to fatigue and which element must be checked accurately at review.



Slika 2: 3D prikaz računskega modela mostu.



Slika 3: Geometrija paličnega nosilca obravnavanega dela mostu.

POTENCIALI, MOŽNOSTI IN PREOBRAZBE URBANIH OBMOČIJ V TRANSFORMACIJI - OBLIKOVANJE SCENARIJEV RAZVOJA

POTENTIALS, OPPORTUNITIES AND TRANSFORMATION OF URBAN AREAS IN TRANSFORMATION - CREATING DEVELOPMENT SCENARIOS

Ljubljana

2015

TIP DELAVNICE *TYPE OF WORKSHOP*
Urbanistično arhitekturna ekonomska projektna naloga – razpis
»PO KREATIVNI POTI DO PRAKTIČNEGA ZNANJA 2015«

KOORDINATORJI *COORDINATORS*
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Delovni mentor: Štefan Štefe (Triglav, upravljanje, svetovanje in trgovanje z lastnimi nepremičninami, d.d.), Urška Kalčič (Grom arch d.o.o.)

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EU sredstva – Evropski socialni sklad

DATUM IN KRAJ RAZSTAVE *DATE AND LOCATION OF EXHIBITION*
1. 10. 2015, Ljubljana, Javni sklad RS za razvoj kadrov in štipendije
15. 10. 2015 , Ljubljana, UL, Fakulteta za gradbeništvo in geodezijo,

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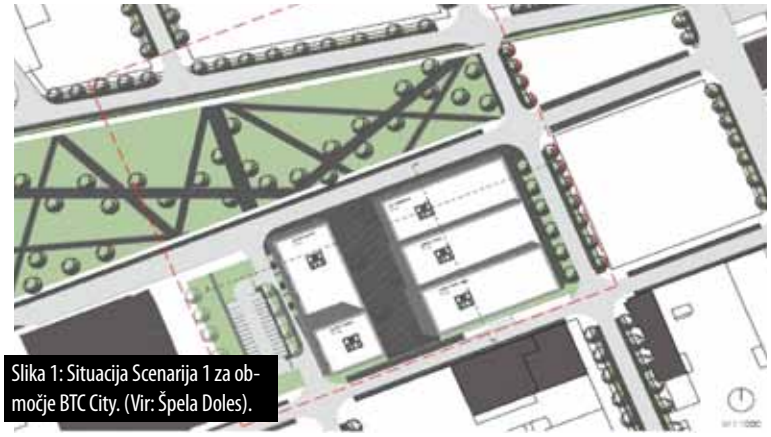
Univerza v Ljubljani
Naložba v vašo prihodnost
OPERACIJO DELNO FINANCIRA EVROPSKA UNIJA
Evropski socialni sklad
JAVNI SKLAD REPUBLIKE SLOVENIJE ZA RAZVOJ KADROV IN ŠTIPENDIJE
REPUBLIKA SLOVENIJA
MINISTRSTVO ZA IZOBRAŽEVANJE, ZNANOST IN ŠPORT

»Projekt delno financira Evropska unija, in sicer iz Evropskega socialnega sklada. Projekt se izvaja v okviru Operativnega programa razvoja človeških virov za obdobje 2007–2013, 1. razvojne prioritete »Spodbujanje podjetništva in prilagodljivosti« ter prednostne usmeritve 1.3. »Štipendijske sheme«, v okviru potrjene operacije »Po kreativni poti do praktičnega znanja«.



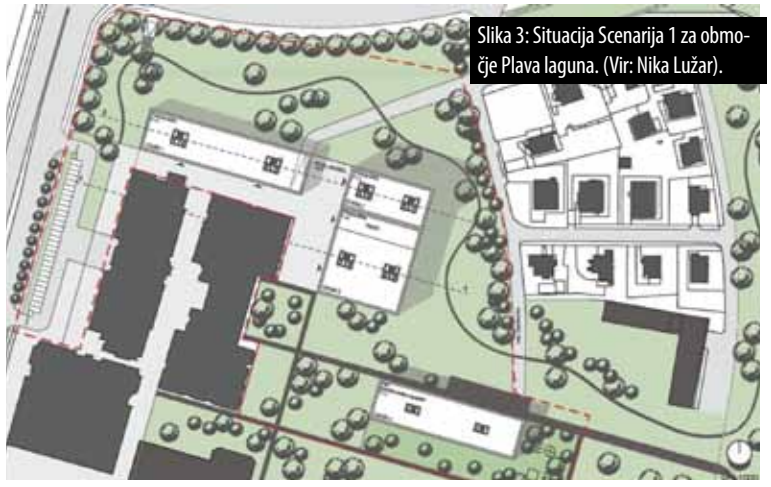
Slika 1: Situacija Scenarija 1 za območje BTC City. (Vir: Špela Doles).

Slika 2: Vizualizacija Scenarij 1 za območje BTC City. (Vir: Špela Doles).

VSEBINA

Projekt je temeljil na sodelovanju študentov urbanistične, arhitekturne in ekonomske stroke.˝Začetek projekta je temeljil predvsem na raziskovanja pojma sodobne poslovnosti in prenosa lete v pomen lokacije. Raziskovalni del je temeljil na odkrivanju medsebojnih učinkov med novimi po-segi ter lokacijo v različnih časovnih intervalih. Z razbiranjem danosti ožjega in širšega prostora loka-cije smo raziskovali potenciale in možnosti, ki jih le-ta ponuja v odnosu do sodobnih vsebin. Glavni izziv ter problem je bilo iskanje posameznih prostorskih elementov, ki bi pozitivno vplivali na razvoj posamezne lokacije. Z raziskovanjem urbanističnih parametrov, smo s pomočjo preveritve razvoj--nih trendov in ekonomsko preveritvijo definirali vrednosti možnih scenarijev.

Aplikacija raziskanih podatkov o sodobnosti ter analiza dveh izbranih lokacij v mestu Ljubljana (Plava laguna in BTC City) je bila usmerjena v model preveritve mešane programske zasnove predvidenih kompozicij v posameznih scenarijih ter na poudarku oblikovanja javnih prostorov. Končni rezultat je 6 natančno obdelanih scenarijev, po 3-je za vsako izbrano lokacijo. Projektni del, je cilj širšega sistema, kjer ni pomembna podrobna trenutna rešitev, temveč širša vsebinska vpe-tost in pomen za prostor: vzpostavljen model, način delovanja sistema, ki celostno obravnava in postavlja pravila delovanja za nadaljnje posege. Struktura vsakega predvidenega scenarija se po-veže z obstoječo situacijo ter urbanistično funkcionira tudi ob predvidenih in nepredvidenih spre-membah.



Slika 3: Situacija Scenarija 1 za območje Plava laguna. (Vir: Nika Lužar).

Slika 4: Vizualizacija Scenarija 1 za območje Plava laguna. (Vir: Nika Lužar).

ABSTRACT

The project is based on the cooperation of students of urban planning, architectural and economic discipline. The project is mainly based on the research on the concept of contemporary business and application of this on the location. The research part is based on the discovering interactions between the new developments and locations in different time intervals. The main challenge and the problem were to locate the indi-vidual spatial elements that would have a positive impact on the development of individual loca-tions. By studying urban parameters, and with the help of the verification of development trends and economic verification, we defined value potential scenarios. The end results are six scenarios, three for location Plava laguna and three for location BTC city.

SUPER MIKROKLIMA V BIVANJSKEM PROSTORU
SUPER MICROCLIMATE IN THE LIVING ENVIRONMENT

Ljubljana

2015

TIP DELAVNICE *TYPE OF WORKSHOP*
Arhitekturna medicinska projektna naloga - razpis
»PO KREATIVNI POTI DO PRAKTIČNEGA ZNANJA 2015«

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Delovni mentorji: Cvetka Dragoš Jančar, dr. med. specialist pediatrije (BARSOS-MC, zdravstvene storitve d.o.o.), Marko Štirn, Anže Štirn (DAMAHAUS PRESTIGE d.o.o.)

ŠTUDENTJE *STUDENTS*
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Javni sklad Republike Slovenije za razvoj kadrov in štipendije
EU sredstva – Evropski socialni sklad

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15. 10. 2015 , Ljubljana, UL, Fakulteta za gradbeništvo in geodezijo,

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Univerza v Ljubljani
Naložba v vašo prihodnost
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Evropski socialni sklad
JAVNI SKLAD REPUBLIKE SLOVENIJE ZA RAZVOJ KADROV IN ŠTIPENDIJE
REPUBLIKA SLOVENIJA
MINISTRSTVO ZA IZOBRAŽEVANJE, ZNANOST IN ŠPORT

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Organski sistemi v človeškem telesu	Simptomi (bolezni)	Potencialni vzroki v bivalnem ali delovnem okolju	Način izpostavljenosti	Glavni viri v bivalnem in delovnem okolju	Priporočila in ukrepi	Raziskava
Dihala	kašelj	delci (PM10 in PM2.5)	inhalacija	delci različnih velikosti, ki izvirajo iz zunanjega in notranjega zraka (kajenje...)	filtriranje zraka in prezračevanje; odstranjevanje delcev pri samem viru	Lewis, 2012
		delci - PM 2.5				
	bronhitis	fini delci	inhalacija	fini delci, ki izvirajo iz papirja	pogostejše prezračevanje, zmanjšanje izpostavljenosti delcem papirja, toškalnikom	Jaakola, 2005
Srčno - žilni sistem	hipertenzija	dolgotrajna izpostavljenost	izpostavljenost zvočnemu valovanju	zunanje, delovno in bivalno okolje	orientacija prostorov, zvočna izolacija, oziroma odstranitev dušenje udarnega zvoka: plavajoči pod, betonski estrih	Basner, 2013 Munzel, 2014
	arterioskleroza					
	hipertenzija					

Prikazali smo nekatere raziskave, ki so obravnavale samo nekatere dejavnike tveganja za zdravje v bivalnem in delovnem okolju. Poudariti je potrebno, da so zelo redke raziskave, ki bi mikroklimo proučevale z različnih zornih kotov in upoštevale vse potencialne dejavnike tveganja.

Slika 3: Od medicine proti arhitekturi.

VSEBINA

Glavni namen projekta Super mikroklima v bivanjskem prostoru je bilo preučevanje mikroklime v bivalnem in delovnem okolju in ugotavljanje dejavnikov v prostoru, ki vplivajo na počutje in zdravje uporabnikov. Projekt preučuje povezavo med arhitekturno zasnovo stavbe ter zdravjem njenih uporabnikov (preučevanje različnih vidikov bivanjske mikroklime, ki vplivajo na zdravje človeka: izbira lokacije, materialov, načinov gradnje, kvaliteta zraka, osvetlitev, temperatura v prostoru, zvok, razporeditev prostorov). Prostor, kjer bivamo in delamo je namreč zelo pomemben za naše zdravje in počutje. Študentje so preko praktičnega dela na terenu (v podjetju ter na terenu - obisk različnih stanovanjskih hiš/ medicinskega centra), spoznavali prednosti/ slabosti različnih arhitekturnih zasnov, izvedli so tudi anketo in intervjuje med različnimi uporabniki.

Projekt rešuje naslednji dve problematiki: (1) pomanjkanje znanja o zasnovi kvalitetne mikroklime v bivalnem okolju in pomanjkanje znanja o vplivih arhitekturne zasnove in izbire materialov/pohištva/barv idr. na zdravje oziroma počutje uporabnikov ter (2) zasnova kvalitetne mikroklime v medicinskih centrih (čakalnicah in ordinacijah). Razdeljen je bil na pet osrednjih poglavij: teoretični pregled, povezava človek-hiša, bivanjski prostor, delovni prostor (medicinski center) ter smernice za uporabnike in načrtovalce. Rezultati projekta nam bodo pomagali pri oblikovanju izobraževalnih vsebin za splošno javnost ter načrtovalce (npr. publikacije, delavnice, predavanja idr.) na temo kvalitetne mikroklime v bivanjskem in delovnem prostoru.

Slika 4. Raziskovanje možnosti izboljšanja mikroklime medicinskega centra Barsos-MC. (vir: Pia Urška Berčič).

Slika 2: Obisk podjetja, Damahaus Prestige. (vir: Damahaus Prestige).

ABSTRACT

Health is our wealth and we are rarely aware that the choice of living environment (houses / apartments) and working environment (school / office) affects it. The main objective of the project »Super microclimate in the living environment« is the effect of living / working environment on our health and well-being. The project examines the connection between architectural design of buildings and the health of its users (the study of various aspects of microclimate, affecting human health: choice of location, materials, methods of construction, air quality, lighting, room temperature, sound etc.). Students worked interdisciplinary (students of architecture and medicine), they visited the companies and they also carried out a survey and interviews between different users.

PILOTNA ŠTUDIJA UMESTITVE IN OBLIKOVANJA ŠTEVCA ZA KOLESARJE

PILOT STUDY FOR LOCATION AND DESIGN OF A BIKE COUNTER

Ljubljana

2014/2015

TIP DELAVNICE *TYPE OF WORKSHOP*
Urbanistično arhitekturna informacijska – razpis
»PO KREATIVNI POTI DO PRAKTIČNEGA ZNANJA 2015«

MENTORJI *MENTORS*
Pedagoški mentorji: doc. dr. Ilka Čerpes (UL, Fakulteta za arhitekturo), viš. pred. dr. Borut Batagelj (UL, Fakulteta za računalništvo in informatiko).
Delovni mentorji: Matjaž Mušič, mag. Polonca Andrejčič Mušič (Cisum Svetovanje d.o.o.), Iztok Šušteršič (Harpoon Elektronika d.o.o.)

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EU sredstva – Evropski socialni sklad

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GRADIVO PRIPRAVILI *MATERIALS PREPARED BY*
doc. dr. Ilka Čerpes, mag. Polonca Andrejčič Mušič

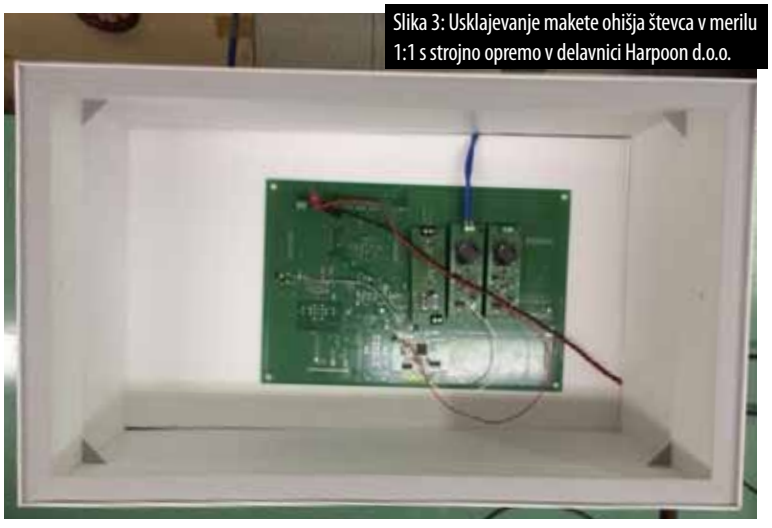
»Projekt delno financira Evropska unija, in sicer iz Evropskega socialnega sklada. Projekt se izvaja v okviru Operativnega programa razvoja človeških virov za obdobje 2007–2013, 1. razvojne prioritete »Spodbujanje podjetništva in prilagodljivosti« ter prednostne usmeritve 1.3. »Štipendijske sheme«, v okviru potrjene operacije »Po kreativni poti do praktičnega znanja«.

VSEBINA

Javni sklad RS za razvoj kadrov in štipendije je novembra 2014 objavil razpis za sofinanciranje PKP projektov, ki z uporabo inovativnega, problemskega in skupinskega pristopa k reševanju praktičnih problemov, v neposrednem partnerstvu visokošolskih zavodov z gospodarstvom, podpira vključevanje študentov v projekte. V okviru PKP projekta je bil predlog »Pilotne študije umestitve in oblikovanja števca za kolesarje«, podprt kot inovativna ideja. Raziskava je potekala v več vzporednih segmentih. Na pilotnem območju priobalnih občin Koper, Izola, Piran in Ankaran, kjer daljinska kolesarska pot predstavlja idealni povezovalni element med urbanimi središči in krajino, smo ocenjevali skladnost, atraktivnost, zveznost, udobnost, varnost in doživljajsko vpetost kolesarske poti v prostor. Izluščili smo nabor vsebin, ki bi jih lahko izboljšali na podlagi realnih podatkov o številu kolesarjev in določali mesta za postavitev novih multi-komunikatorjev. Obenem smo izdelali optimalni prototip multi-komunikacijske naprave ter izdelali programsko orodje za prenos in obdelavo podatkov pridobljenih s pomočjo avtomatskih števcev za kolesarje. Nova metodologija povezovanja fizičnega in digitalnega sveta omogoča on-line dostop do informacij in boljše pogoje za kolesarski promet, prikazovalnik podatkov pa je učinkovito orodje za spodbujanje kolesarjenja.

ABSTRACT

The Public Fund for Human Resources Development and Scholarship Fund of Slovenia published a tender for co-financing projects under common title "Creative Way to Practical Knowledge" (PKP). Project provides partnership of high-education institutions and economy and supports innovative approach by solving practical problems while inclusion of students in the projects. The Cyclists Counter Placement and Design Pilot Study were implemented in the context of Parenzana Cycling Trial along Slovenian Adriatic coast. By connecting the physical and the digital the better cycling traffic quality and popularity can be achieved.



Slika 3: Usklajevanje makete ohišja števca v merilu 1:1 s strojno opremo v delavnici Harpoon d.o.o.

VI.

SEZNAM AVTORJEV

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