

# Bardha Meka, Armir Ferati: ORIENTACIJA V BOLNIŠNICI: PROSTORSKA RAZPOREDITEV IN PROSTORSKA KOGNICIJA V KOSOVSKEM UNIVERZITETNEM KLINIČNEM CENTRU V PRIŠTINI HOSPITAL NAVIGATION: SPATIAL CONFIGURATION AND SPATIAL COGNITION IN UNIVERSITY CLINICAL CENTER OF KOSOVO IN PRISHTINA

DOI: <https://doi.org/10.15292/IU-CG.2021.09.048-057> ■ UDK: 725.5:612.881(497.115) ■ SUBMITTED: May 2021 / REVISED: June 2021 / PUBLISHED: December 2021



1.02. Pregledni znanstveni članek / Review Scientific Article

## POVZETEK

Namen tega članka je analizirati enostavnost orientiranja oseb po kosovskem univerzitetnem kliničnem centru v Prištini (UCCK). V bolnišničnem okolju je cilj enostavna in samostojna orientacija uporabnika do cilja, da se zmanjšajo negativni vplivi na dobro počutje ljudi in operativne stroške. Orientacija je pomembna za zaposlene, ki poznajo okolje, in obiskovalce, ki ga ne poznajo. Članek se osredotoča samo na osebe, ki bolnišnično okolje poznajo, tj. na zaposlene. Raziskave so pokazale, da je orientiranje odvisno od jasnosti ureditve komponent stavbe ter da obstaja tesna povezanost med orientacijo in prostorsko razporeditvijo. Večina študij o orientaciji v bolnišnicah je osredotočena na stavbo, ta članek pa je osredotočen na bolnišnični kampus univerzitetnega kliničnega centra, ki spada v tipologijo paviljonov. Kot tak si z mesti deli številne podobnosti in ima veliko bolj zapleteno strukturo kot druge bolnišnične tipologije. Ta članek skuša odgovoriti na dve vprašanji: kako enostavno se je orientirati v kosovskem univerzitetnem kliničnem centru ter kakšna je povezava med prostorsko kognicijo in prostorsko razporeditvijo v bolnišničnem okolju. Raziskava se naslanja na kognitivni pristop, ki ga je zasnoval K. Lynch in temelji na zaznavnih kartah, ter na konfiguracijski pristop, ki temelji na teoriji in metodologiji sintakse prostora. Članek ugotavlja, da kosovski univerzitetni klinični center nima jasne podobe in ima nizko raven razumljivosti. Rezultati te raziskave bodo v pomoč pri oblikovanju prihodnjega splošnega načrta bolnišničnega kampusa.

## KLJUČNE BESEDE

zaznavna karta, karta osi v prostoru, razumljivost, percepcija, obnašanje

## ABSTRACT

The aim of this paper is to analyse the level of ease at which people navigate within the University Clinical Centre of Kosovo in Prishtina (UCCK). In a hospital setting, the objective for the user is to navigate easily and independently to the destination in order to reduce negative impacts on human wellbeing and operational costs. Navigation is important for employees, familiar with the environment and for visitors, unfamiliar with it. However, the paper is focused only on those familiar with the hospital setting – employees. Research has shown that navigation depends on the clarity of the built form's component arrangements; that there is a high correlation between navigation and spatial configuration. Most of the studies on navigation in hospitals are focused on building scale. This paper is focused on the hospital campus of (UCCK) which belongs to the pavilion typology. As such, it shares many similarities with cities and has far more complex structure than other hospital typologies. So, the questions this paper is trying to answer are: how easy is to navigate within UCCK; what is the relation between spatial cognition and spatial configuration in the hospital setting? To answer, the research is leaning on the cognitive approach designed by K. Lynch based on mental maps and on the configurational approach based on space syntax theory and methodology. The paper reveals that UCCK lacks a clear image and has a low level of intelligibility. The outcome of this research should impact the future master plan of the hospital campus.

## KEY-WORDS

mental map, axial map, intelligibility, perception, behavior

UVODNIK  
EDITORIAL  
ČLANEK  
ARTICLE

RAZPRAVA  
DISCUSSION  
RECENZIJA  
REVIEW  
PROJEKT  
PROJECT  
DELAVNICA  
WORKSHOP  
NATEČAJ  
COMPETITION  
PREDSTAVITEV  
PRESENTATION  
DIPLOMA  
MASTER THESIS

## 1. INTRODUCTION

The paradigm shift in healthcare came with an advanced approach regarding healthcare environments by promoting the concept of humanization in designing of hospitals. One of the intentions is to create welcoming places, where “the user should be able to perceive them as simple and cross it instinctively without being confused” (Pellitteri and Belvedere, 2014, p. 229). In this sense, when entering a hospital, the objective is to move independently to the destination. High demands on the design quality should avoid difficulties in finding the way, which for severely ill patients, may result in fatal consequences. Obviously, wayfinding has a lot to do with the path network. People’s ability to navigate in a certain environment is affected by the street network or the spatial configuration – the whole system of relations between streets. It affects both, people’s perceptions (K. Lynch, 1960) and people’s behaviour (Hillier, 1993; Hillier, 1996; Hillier, 2005). Various systems, have various levels of relationship complexity, be it a settlement or hospital. The complexity of relationships increases in the case of hospitals with pavilion typologies, which by itself shows some shortcomings in terms of orientation and circulation due to the distribution of health activities in different pavilions. On the other hand, these typologies are in accordance with general trends of hospital design with particular emphasis on the human dimension (Torricelli, 2005).

The University Clinical Centre of Kosovo in Prishtina (UCCK), which is chosen as a case study, belongs to the pavilion typology. What is interesting to investigate, is not only the influence of the typology but the impact of the transformations it endured during its evolution on orientation and navigation (for the sake of efficiency). The transformations were mainly piecemeal additions and renovations, with no regard to user’s perception and behaviour, which resulted in a poorly organised path network, deteriorating the circulation system and obscuring the clarity of the hospital setting, particularly the ease of identifying main functional areas and their access points. Therefore, the paper is first trying to reveal the underlying structure of the spatial configuration of UCCK; second, how people navigate and behave within the hospital; and third, what is the relation between the spatial configuration and users perception, navigation or wayfinding in the hospital setting. The outcome of this research should have an impact on future development of the hospital complex.

In order to answer these questions, the research is based on two approaches. The first one is adopting K. Lynch’s cognitive approach. It is focused on information obtained from individual perception of the environment through mental or cognitive maps. The second approach is the configurational approach based on space syntax theory and methodology. Both approaches are interrelated and it is suggested that both must be taken into account for a more holistic approach. A detailed explanation of the approaches and their respective methodologies is given in the following sections of the paper.

Navigation through a hospital setting is important for both, employees, familiar with the environment and for visitors, unfamiliar with it. However, this research is focused only on those familiar with the hospital setting – employees and their ease of orientation and navigation, implying also further investigation taking visitors into account.

After the theoretical background and literature review, the second part of the study gives a brief overview of the University Clinical Centre of Kosovo in Prishtina and its evolution in terms of spatial organization. Further on, the paper continues to explain the approaches and methods adopted in the exploration of the hospital setting. The analysis and a discussion on the results is presented in the fourth part of the paper. This section is focused on the mental maps drawn by subjects and on the configurational analysis of the UCCK. Again, K. Lynch’s approach is adopted in order to obtain information from the mental maps, while space syntax is the core theory and methodology for the configurational analysis.

## 2. THEORETICAL FRAMEWORK

Reaching the destination from an entrance as easily as possible in a hospital setting is of fundamental importance. It’s important for both, the patients and the medical staff. Beside the most important fact that efficiency can save lives, it also can save a lot of irritations and operational costs. In this sense hospital settings share many similarities with cities due to their complexity. In order to reach the destination from a certain point in the setting the environment usually or is supposed to give clear cues. Clear and well organised elements of built form (streets, squares and urban blocks) enable people to read, understand and interpret the environment. And “the ease with which its parts can be recognised and can be organised into a coherent pattern” (Lynch, 1960, p. 2) determines the level of legibility of the environment. The concept of legibility as a quality of the environment was introduced by K. Lynch (1960) in his book *The Image of the City*. According to Lynch people represent the environment – the city through mental maps of spatial relations between the components of built form. Those components (explained in more detail in the following parts of the paper) are paths, landmarks, nodes, edges and districts. When moving through and around a settlement people use these elements for navigation and orientation. These findings are obviously applicable in hospital settings. The similarities between cities and hospitals, or between urban planning and hospital design were noted by Sadek (2015), Wagenaar (2018) and Mens (2018). “Hospitals that contain stable, distinctive and highly recognizable paths, nodes, landmarks, edges and districts are inherently more legible and easier to navigate than those that do not” (Mens, 2018, p. 65-66). One of the main objectives of this paper is to explore the legibility of UCCK by utilising K. Lynch’s empirical approach.

Martinez (2010) claims that “the aim is that the building, with a clear and simple layout, must be the main device for orienting people to their chosen destinations”. Michael J. O’Neill (1991) considers signage as elements to enhance

Figure 1: Hospital center within the city of Prishtina, 1956 (a). Planned facilities in the Hospital Center in Prishtina, 1956 (b): 01. Future main entrance, 02. Main entrance, later – supply entry; 1. Surgical block, 2. Internal medicine unit, 3. Children's hospital, 4. Infectious disease unit, 5. Supply and maintenance part. (source: Archive of the Municipality of Prishtina, Fund 71, no. 1367).



wayfinding efficiency but he claims that “as floor plan complexity increases, wayfinding performance decreases”. To compensate this insufficiency, adding more signs is not the right response (Carattin, 2011). Although the role of signs is not disclaimed, most researchers consider it as complementary, emphasising the role of configuration. In the designing process, it is important to consider that “all branches from a main path, all angles, all variations of the path that deviate from right angles in the plan, constitute obstacles for the visitor or for the patient who wants to orientate in the hospital” (Rossi Prodi and Stocchetti, 1990, p. 250).

The importance of the path network or the spatial configuration and its effect on behaviour is further emphasised by Hillier and colleagues through space syntax theory (Hillier, 1993; Hillier, 1996; Hillier, 1999; Hillier, 2005). According to this theory there is a high correlation between the level of accessibility (centrality) and movement flows. More people move on more central (integrated) spaces and less people on segregated spaces – streets (Hillier, 1993; Hillier, 1999). Peponis and collaborators (1990) utilised space syntax theory and methodology to study hospital layouts. Just as Hillier’s theories state, they observed that more people move on more central spaces and that when people face spatial dilemmas, they usually turn to these central locations in order to decide their further movement. The importance of configuration – the topological relations between all streets of the network on navigation and orientation in hospitals is confirmed by Haq and Zimring (2003) and Haq and Giroto (2003). Haq and Giroto (2003) proved that intelligibility, which is a measure defined by the correlation between connectivity and global accessibility (integration) is a good wayfinding predictor. However, most of these studies were performed on a building scale. This paper is focused on a relatively larger scale on a hospital setting - UCCK that belongs to the pavilion typology.

## 2. SPATIAL EVOLUTION OF UNIVERSITY CLINICAL CENTER OF KOSOVO

The General Hospital in Prishtina was established in 1958, while the Faculty of Medicine was founded in 1969. Later, in 1973, they were merged into an integrated organization as Faculty of Medicine with constituent clinics. On 2003, it was renamed the University Clinical Centre of Kosovo (Krasniqi, 2018). University Clinical Center of Kosovo is the only tertiary health care facility in Kosovo, constituted of 37 clinics, institutes and services, with a total number of 1908 of beds (SHSKUK, 2018). It is a referent medical institution and its catchment includes the whole country. In the absence of a regional hospital in Prishtina, it also performs secondary level services for the citizens of Prishtina.

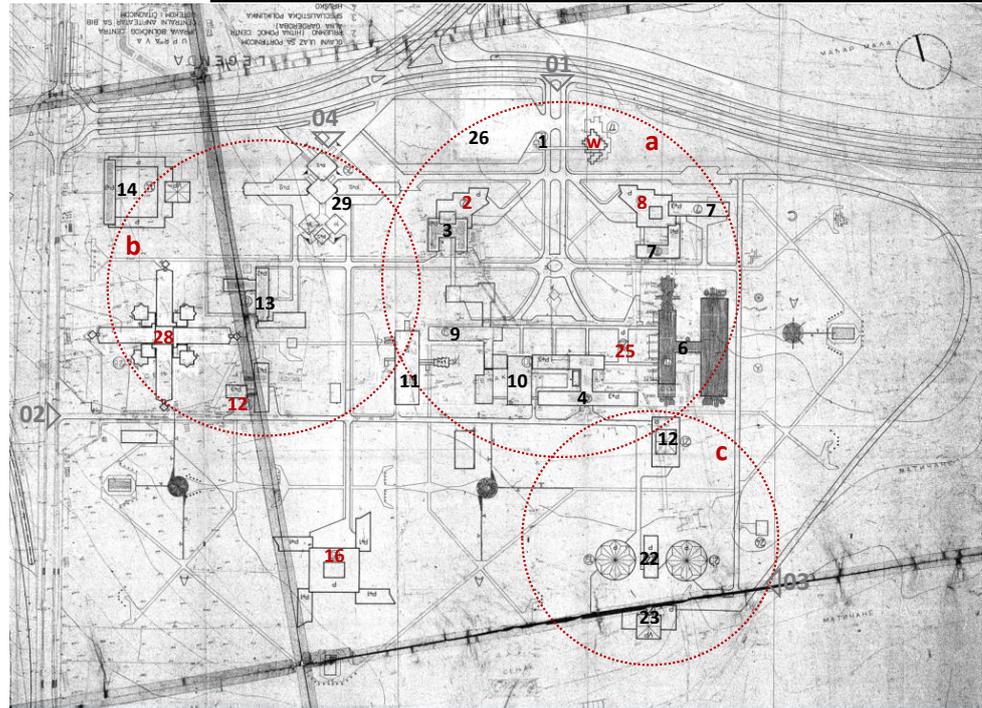
The location of the Prishtina Hospital Center was approved in 1956, in an area of 10 ha, on the outskirts of the city of Prishtina, in close proximity to the road Prishtina – Skopje (Figure 1a), with four facilities planned as follows (Figure 1b): Surgical block, Internal Medicine Unit, Children’s Hospital and Infectious Diseases Department (Vujic, 1956). The surgical block still retains the same position and function. Main entrance to the hospital centre was on the west of the location (02) and continued to the surgical block. According to this plan, the future main entrance is relocated to the north (01).

A detailed urban plan for the hospital complex was adopted in 1967 (Figure 2), which is an update of the urban plan of Prishtina Hospital Centre of 1956, in the same location. The plan was based on modernist ideologies, freestanding buildings – pavilions arranged across the site, linked but detached from the path network. According to the plan, some of the main parts of the pavilions were supposed to be linked by internal connections (Janković, 1980), which up to date, never happened. This plan clearly suggests the

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

Figure 2: Detailed urban plan of Prishtina Hospital Center, 1967; Health care activities (a), training, teaching and research activities (b), and supply and maintenance (c); Numbers in red represent unbuilt facilities; 14 and 29 are partially built (Source: Archive of the Municipality of Prishtina, Fund 71, no. 1392).

1. Entrance gate
  2. Reception (first aid, central cloakroom)
  3. Specialist outpatient clinic
  4. Surgical clinic
  5. Gynecological Clinic
  6. Obstetric clinic
  7. Pediatric clinic (internal medicine and chest)
  8. Pediatric polyclinic
  9. Internal medicine and Dermatovenerology Clinic
  10. Intermediate (ORL, Oncology, Radiology)
  11. Infectious disease clinic
  12. Pulmology clinic
  13. Institute of Hygiene
  14. Medical High School
  15. Medical high school dormitory
  16. Neuropsychiatry
  17. Management of the hospital center
  18. Central amphitheater with library and reading room
  19. Supplier
  20. Garages and stores
  21. Kitchen
  22. Laundry
  23. Heating plant
  24. Morgue
  25. Shop
  26. Central parking lot
  27. Prosecutor
  28. Biological institute
  29. Institutes of the Faculty of Medicine with deanery and amphitheatres
01. North/Main entry
  02. West entry
  03. East entry
  04. Pedestrian access to institutes and Faculty of Medicine



separation of three principle movement streams: a) health care activities, b) training, teaching and research activities, and c) supply and maintenance. As figure 1 shows, health care activities (circle a) were supposed to be reached through radial road network, enabling simple and rational spatial distribution through a hierarchy of routes, thus contributing to the legibility of the environment for patients and visitors. Access to the other activities was provided from separate entries (circle b and c).

As the city grew and evolved, the hospital became part of the urban area of Prishtina, located in the northern part of “new Prishtina - west area” (Figure 3). The topography of the UCCK location is mainly flat, at an average altitude of 600m (Plani rregullues “Prishtina e Re - Zona perëndim”, 2013). The location is now bounded on the north by high standard urban roads, through which it is connected to the regional road network (Figure 4).

The main entry of the hospital (01), designated on the north since 1956, as such was designed in the 1967 plan (Figure 2), which still serves the same purpose (Figure 4). West entry (02), which is accessed from the urban road Shkupi, designated as a supply and maintenance entrance since 1956, actually serves as a secondary entrance to the complex. According to the 1967 plan, the east entrance (03) is presented as a supply entry, while currently, accessed through intersections of local roads is open to the surrounding

neighbourhood. The 1967 plan provided another pedestrian entrance from the north (04), which would serve as an access to the Institutes and the Faculty of Medicine. This entrance was not built and as a consequence informal roads emerged.

Until 1999 the site was developed mainly respecting the plan of 1967. But, the observation by Martinez (2010) that “hospital buildings and hospital campus grow, often without a long-term vision and design is largely driven by clinical briefs and not user’s environments” happens to be true in the case of UCCK as well. Continuous transformations of the hospital complex, with-

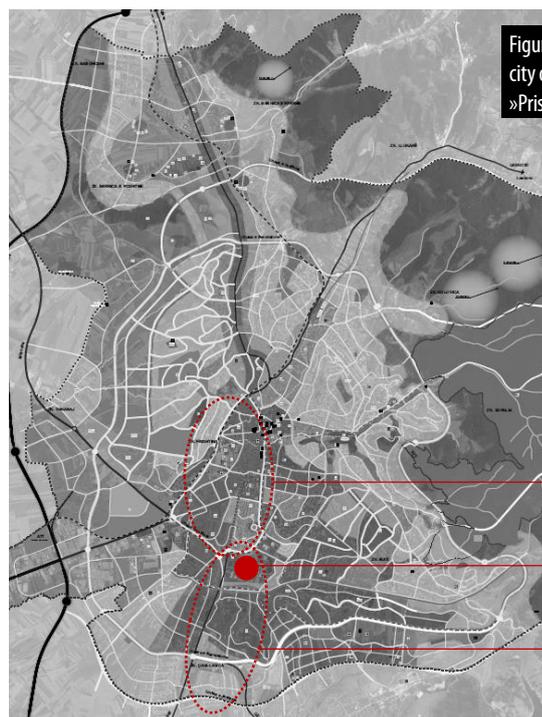


Figure 3: UCCK in relation to the central ring of the city of Prishtina (source: Urban Development Plan »Prishtina 2012-2022«).

Figure 4: The layout of the University Clinical Centre of Kosovo, 2019 (Source: authors).

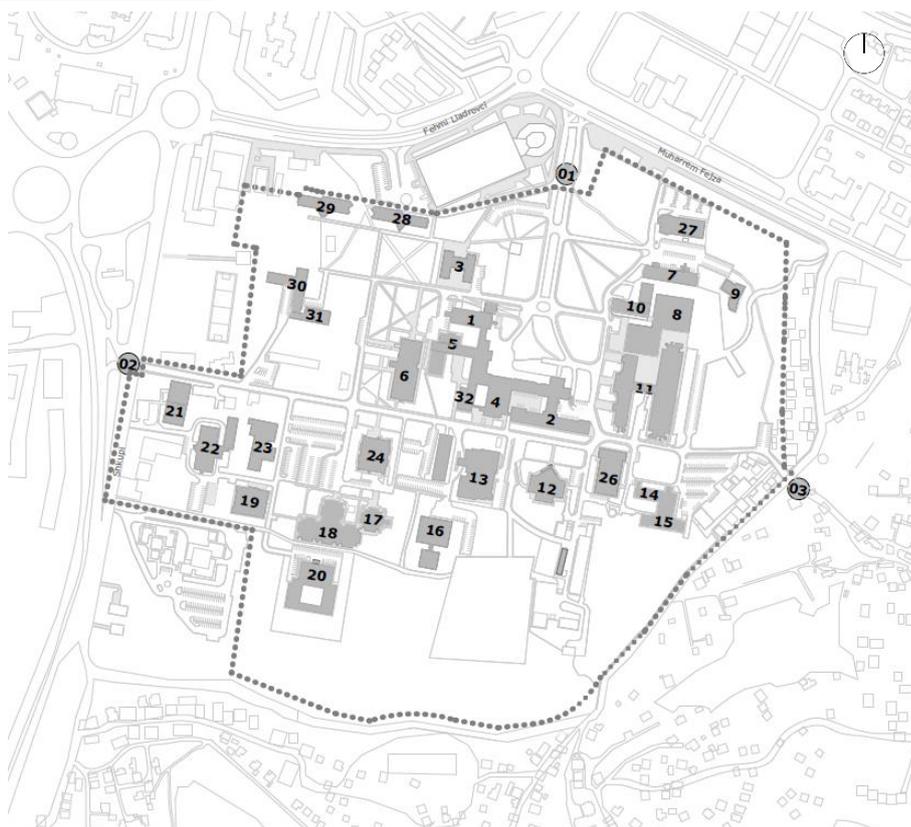
1. Emergency care center
2. Surgical clinic
3. University Dentistry Clinical Center
4. ORL clinic
5. Internal medicine clinic
6. Infectious disease clinic
7. Pediatric clinic
8. Pediatric surgery
9. Child and adolescent psychiatry
10. The National Center of Blood Transfusion
11. Obstetric Gynecological Clinic
12. Institute of Oncology
13. New Emergency care center
14. Dermatovenereology Clinic
15. Pulmology clinic
16. Orthopedics and Traumatology Clinic
17. Neurology Clinic
18. Psychiatry Clinic
19. Intensive psychiatry
20. Institute of Forensic Psychiatry
21. Ortoprotetics
22. Institute of Forensic Medicine
23. New building of the Management of the Faculty of Medicine
24. UCCK administrative building and outpatient clinics
25. Laundry
26. Kitchen, technical services
27. Kosova Medicines Agency
28. Preclinical institutes A
29. Preclinical institutes B
30. National Institute of Public Health of Kosovo
31. Management of the Faculty of Medicine
32. Library

01. North/Main entry

02. West entry

03. East entry

--- Location boundary



out necessary criteria, have shaped its spatial configuration. As stated above, these transformations were reflected in orientation and circulation system of the complex. Insufficient to fulfil current needs, the original urban plan is compromised.

University hospitals are complex building types “since, apart from its functional, technological and management complexity, typical for hospitals in general, it presents a further level of complexity as a result of the presence of healthcare, research and teaching on a single site” (Giovenale, 2009). University Clinical Center of Kosovo experiences same efforts of integration on specific type - that of pavilions, built in the 70s and the 80s. Buildings are multistorey, varying from one to six, with attributes of modern architecture style and apparently a mixture of linear “H”, “T”, “I” types, “random pavilions” and “centreed cluster”. Regarding the connection between wards and care unit, they mostly belong to the “horizontal type”.

### 3. METHODOLOGY

In order to reveal the level of legibility (Lynch, 1960) of UCCK, the research is based on a combination of K. Lynch’s empirical methodology and space syntax’s configurational approach. The former is focused on the physical attributes and perception effects of physical structures and the latter on the configurational properties of the spatial configuration. The model designed by Lynch is in fact a mental construct that people structure for spatial schemes and it is supposed to reveal the main navigation components for orientation while moving through spaces (Watson, Plat-tus and Shibley, 2003). Lynch, classifies the components in groups of five elements: paths – movement channels along which people navigate the city; nodes – strategic focal points in the city; landmarks – external reference points

defined by physical object; edges – linear elements along which regions are separated or joined together; and districts – two dimensional elements or areas with identifiable character (Lynch, 1960). Depending on the environment, one or more of these elements are more dominant and significant for the image that people have of a certain environment. To reveal which one of these elements is dominant and how they are related at the UCCK campus, fifty one (51) participants (UCCK employees) randomly selected from different locations – workplaces were asked to sketch mental maps of the built environment within the hospital on blank sheets of paper, based on their memory of the spatial structure of the campus. Different locations are chosen in order to reveal both, the local-immediate surrounding and global structure of the campus. The frequency of appearance of the elements and the clarity of their representations on the mental maps is supposed to be a good indicator of the level of legibility of UCCK campus.

On the other hand, relevant research has shown that mental maps and wayfinding behaviour correlates well with configurational properties of the spatial configuration, that topological relations are reliable indicator of wayfinding behaviour (Haq, Hill and Pramanik, 2005) and that the influence of geometrical and topological properties of the layout on movement is a cognitive effect (Hiller and Iida, 2005). Therefore, to reveal the topological properties of the layout space syntax is being utilized as the core theory and methodology for the analysis of the spatial configuration of UCCK. In order to process the analysis, the spatial structure of UCCK is decomposed into axial lines and represented as an axial map. “An axial map of the open space structure of the settlement will be the least set of

(axial) lines which pass through each convex space and makes all axial links" (Hillier and Hanson, 1984, p. 91-92). An axial line is the longest line of visual reach (Hillier and Hanson, 1984) and it corresponds to movement lines. So, the key criteria for drawing or generating axial maps, also used by authors of the paper for drawing the UCCK axial map, is to minimise the number of intersecting lines that pass further through each spatial entity (convex space) of a certain spatial layout. Further on, the axial map is a representation of a mathematical model of a graph. The graph is actually an abstract representation of a set of elements and their relations, in which each element is represented as a vertex, and each relation between a certain pair of elements as an edge. What this means is that the axial line is the basic element of the graph and it is represented by a vertex on the graph thus allowing mathematical analysis of the configurational properties of each spatial entity as well as the whole system (Ferati and Saidi, 2020). However, due to the complexity of the calculations, we must rely on computer based analysis. Therefore, the axial map is analysed through Depthmap - a software for spatial network analysis developed at UCL. Among many, integration - the relative accessibility of a space within a spatial system and choice - the relative location of a space between all possible pairs of spaces in the spatial system, are key mathematical-syntactic measures used in the paper. These measures can be calculated at different radii, ranging from local radius which takes into account the local network of public spaces, to global radius (RN) which takes into account the whole network of the system of public spaces. On the maps, red colour indicates higher configuration values, opposed to blue ones which indicate lower configurational values. Hillier and colleagues were able to find a high degree of correlation between accessibility values and movement flows (Hillier, 1993; Hillier, 1996; Hillier, 1999). Local scale movement is best reflected at a lower radius and larger scale movement is best reflected at a higher radius, usually taking into account the whole network (RN).

The paper is also focused on people's behaviour and how they utilise the spatial configuration of UCCK. In order to reveal movement patterns, on-site observations and

counting people moving within the hospital setting were carried out. The method is known as gate counting (Grajewski, 1992; Vaughan, 2001), and it serves to collect data on pedestrian movement, revealing which street or route has higher or lower movement flows. The data later can be compared to the syntactic values of the spatial configuration through correlation analysis. Gates are specific locations on the path network where the observant stands and collects the data – number of people moving through the gate in specific time frames over the course of the day. Thirty six (36) locations are chosen as gates in UCCK (Figure 8). Three different categories are counted: patients, visitors and medical staff - employees, but only the medical staff is taken into consideration for the purpose of this research since it is focused only on those familiar with the environment. Each gate is observed for five minutes at one hour interval throughout the day, starting at 7:00 a.m. and finishing at 19:00 p.m.

In addition to the syntactic properties, the research also focuses on the relationship between parts and wholes, as the relationship or the correlation between local (connectivity) and global accessibility (integration) values is a reliable indicator of the degree of ease at which people navigate through an environment, or how much information about the overall structure of the city people gain from their immediate local surrounding i.e. intelligibility of a system (Arruda Campos, 1997).

#### 4. COGNITIVE MAPS AND SPATIAL CONFIGURATION ANALYSIS

The analysis of the UCCK employee sketches reveals the perception effects of the underlying physical structure of the hospital campus. Although not clearly enough, paths, as expected, appear relatively more frequently on the maps and represent the most dominant elements. The other elements of the image of the environment such as the nodes, landmarks, edges and districts are missing and can't be extracted from the mental maps drawn by the employees of UCCK, indicating that navigation and orientation is difficult on the campus. Figure 5 shows the appearance of

Figure 5: Path by frequency appearance on sketch maps. University Clinical Centre of Kosovo.

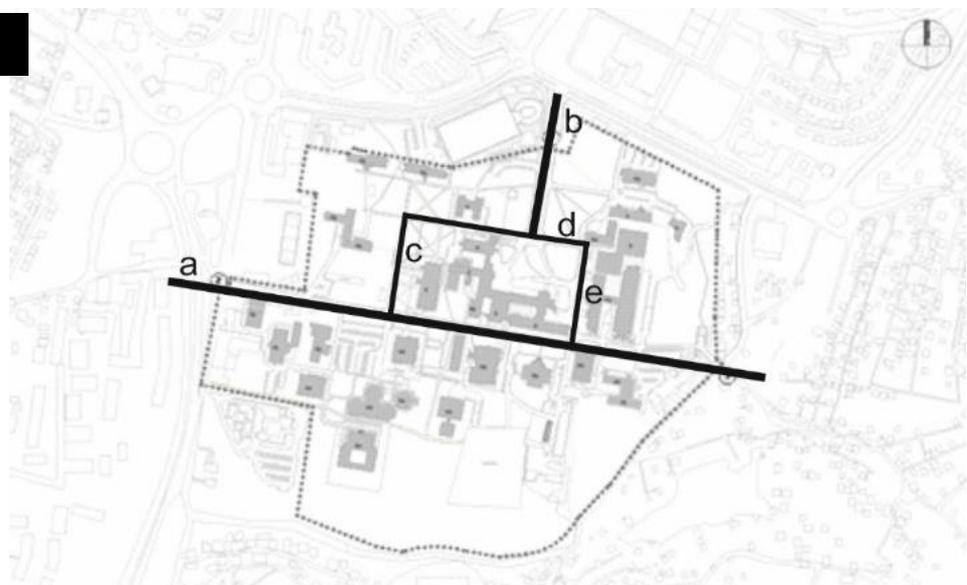


Figure 6: Global Integration RN. University Clinical Centre of Kosovo.



Figure 7: Local Integration R3. University Clinical Centre of Kosovo.



paths by frequency on the sketched maps. The thicker the line of the path on figure 5, the more frequent its appearance on the sketches. Employees pick path **a** and path **b** as the main routes in the spatial system of the campus for orientation. With no distinct landmark on the site, most of the facilities are sketched along these routes. However, while path **a** and **b** can be extracted from the sketches, their relation to one another is hardly evident. The sketches become more labyrinthine when participants connect routes between path **a** and **b**. Nevertheless, path **c**, **d** and **e** stand out from the rest of the routes that lead from **a** to **b**.

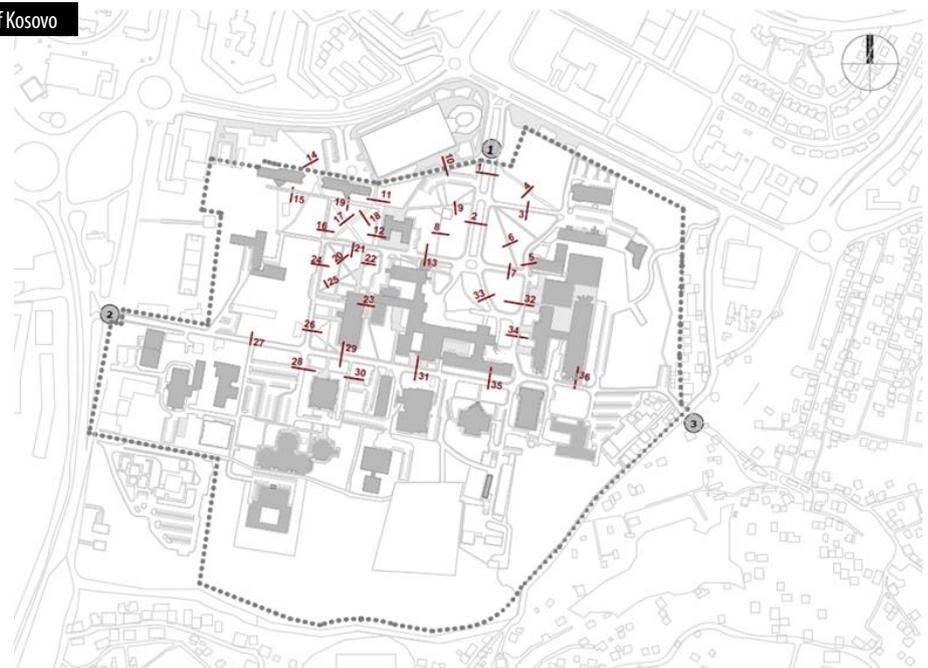
In order to understand the spatial configuration of UCCK the research is also focused on the syntactic properties and the relation between parts and wholes – intelligibility expressed as a correlation between local and global accessibility (integration) values.

The processed axial map on a global scale at RN – taking into account the whole spatial configuration (Figure 6),

reveals path **a** as the most integrated in the street network of UCCK. Next to path **a**, path **c**, **d** and **e** also belong to the most integrated set of spaces in UCCK. Similar results appear on a local scale R3 (Figure 7). The insignificant difference between local and global integration is due to the small topological size of the campus itself. Hillier and colleagues through his centrality as a process, natural movement and movement economy theories were able to find a high degree of correlation between accessibility values and movement flows (Hillier, 1993; Hillier, 1996; Hillier, 1999). The more integrated a space is, the more movement it has. So, it is to be expected that precisely these paths serve as the main movement distributors in the hospital campus.

Comparing the results from the configurational analysis and the mental maps the correlation becomes obvious. The most accessible (integrated) routes in UCCK are the main paths in the image of UCCK. However, path **b**, an important path on the mental images of the employees, is

Figure 8: Gate counts location. University Clinical Centre of Kosovo



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

Table 1. Gate counts at University Clinical Centre of Kosovo.

Gates	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	Staff movement/07:00-19:00	Avg	Avg/h
1	2		1	1	2		3	2				1	12	3	36
2	3			1						1			5	3	30
3		2	1										3	2	24
4													0	0	0
5	2	3	4	5	1	14	1	1	1		1		33	6	72
6					1					1		1	3	2	18
7			8	4	1	1	4	3				2	23	6	69
8	6						2	7	3	1	5	2	26	7	78
9			1						1			1	3	2	18
10	4			3		1	1	2				2	13	4	45
11	8		7		1		1	7	4	4	9	1	42	8	101
12	6	6	4	4	4	2	2	5	2	4	1		40	7	80
13	2	6	9	2	5	1	4	2	2	7	4	2	46	7	85
14	5	2	0	0	2	1	0	1	1	5	0	0	17	3	31
15	5	5	8	5	0	6	1	1	0	2	0	0	33	5	61
16	0	5	1	2	9	3	2	1	0	1	1	1	26	4	48
17	0	0	2	0	2	0	0	0	0	0	0	0	4	1	7
18		3	1		2								6	3	36
19	2	9	5	8	11	2	3	3	2				45	9	108
20					1	1							2	1	16
21		1		1			2					1	5	2	24
22			1				1						2	1	16
23		3	8	5	2	6	5	3	2	3		2	39	7	85
24					3		1				1		5	3	30
25				1	2		3	1			1		8	3	32
26		3	1	3	6	9	16	2		1			41	9	109
27	1			1	6	2	16	3			7	5	41	9	109
28		2	2		2	3	2		2	3	2	1	19	4	46
29	3		3	3	5	4	9	1	3	1	4	6	42	7	84
30	1	2	3	4	5	9	9	2	3	1	3	2	44	7	81
31	3	7	8	13	11	8	12	6	0	5	3	5	81	12	150
32	0	0	6	1	1	4	5	2	1	0	2	0	22	3	41
33	0	1	2	1	1	3	4	0	1	0	0	1	14	2	26
34	5	2	5	2	10	0	2	1	1	3	1	1	33	5	61
35	1	13	15	1	4	18	13	3	0	0	5	2	75	12	138
36	2	8	7	4	9	9	14	3	1	0	2	3	62	10	114

less integrated than the other ones into the configuration of the hospital path network. This is probably due to the main entrance of the hospital on path **b**. The location of the main entrance seems to impact movement distribution and shifts path **b** into one of the main movement distributors, although its configurational properties do not suggest that. But that is so only when people enter and leave the hospital. Path **b** doesn't function as a link between the hospital facilities and activities. If we analyse the data form on site observations - gate counting (Table 1, Figure 8 and Figure 9) it becomes obvious that path **a** as the most

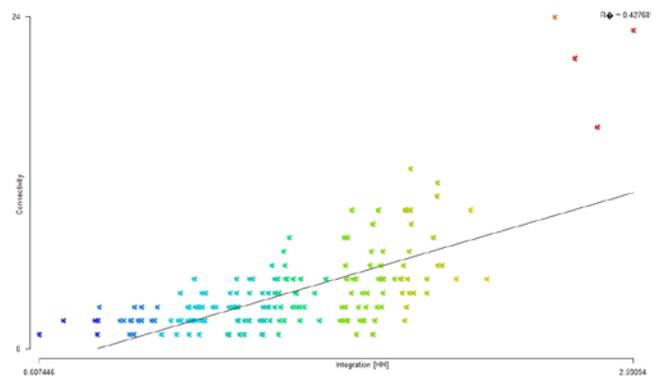
integrated serves as the main movement distributor in the hospital setting as far as the employees are concerned. On average, more employees move through path **a**, than any other route in the campus. Some moderate movement is observed on few gates (11 and 19) that, looking at the processed maps of integration, are not expected to be as active. The fact that gate 11 is close to the public parking and gate 19 close to the preclinical institutes, which serve for teaching and research, explains the movement pattern distortions.

Figure 9: Average number of people per gate plotted against Global Integration RN map. University Clinical Centre of Kosovo.



A good indicator of the legibility of a certain spatial setting is the relation between parts and wholes of a spatial configuration, expressed as intelligibility. Intelligibility is expressed as a correlation of local and global integration values (Figure 10). The regression analysis shows relatively low level of intelligibility in UCKK - R2=0.427. It means that relatively poor information can be gained from a certain location about the overall structure of UCKK. The difficulty

Figure 10: Intelligibility. University Clinical Centre of Kosovo.



employee face while navigating through the hospital expressed by intelligibility is also evident from the sketch maps drawn by the participants. The mental maps become more chaotic on locations where movements branch from path b to the surrounding areas of the spatial configuration.

The comparison between the analysis of the mental maps and the configurational analysis of the hospital campus reveals that there is a relevant correlation between the syntactic properties of a setting, behaviour and the perception effects caused by the settings physical arrangement. The research also indicates that in order to maximize the ease at which people navigate through an environment and in order to create a clearer image of the environment a holistic approach which takes into account individuals perceptions and behaviour is necessary.

## 5. CONCLUSION

Wayfinding is the process of navigation and orientation through the environment with a certain degree of ease. In hospital setting this process of spatial behaviour is supposed to be as efficient as possible, since a delicate matter like saving lives is concerned. Even more so on pavilion hospital campuses such as University Clinical Centre of Kosovo which prove to share many of the complexities with cities.

The paper shows that employees face difficulties grasping the image of UCCK. Their mental maps are fragmented and blurred. Although not clearly enough, the most integrated routes in the system of networks represent the main paths in the cognitive maps of people who navigate within UCCK. On site observations show that the staff is utilising these spaces to reach their destinations within the campus. On the other hand, the findings also show that UCCK's spatial configuration has relatively low level of intelligibility, which generally corresponds to the variety of paths drawn on the mental maps beside the main paths. While the main paths could be distinguished, the rest of the routes were more labyrinthian-like in the sketches drawn by the medical staff. Obviously, they are missing a clear image of UCCK as a whole. One of the reasons for such a blurry image must be the process of piecemeal development of the campus.

However, the hospital serves not only the employees and people familiar with the hospital environment, but also visitors who are unfamiliar with the hospital setting. In order to function effectively with minor consequences on people lives and to fully understand the dynamics of the spatial configuration of the University Clinical Centre of Kosovo in the context of spatial cognition, further research based on the perception of visitors and their behaviour in an unfamiliar setting is necessary. Also it would be interesting whether the configurational properties of the campus change when the whole spatial configuration of Prishtina is taken into account.

## REFERENCES

- Arruda Campos M. B. (1997). Strategic Spaces: Patterns of Use in Public Squares of the City of London. *Proceedings of the First International Space Syntax Symposium*. London: University College London
- Carattin, E. (2011, October). Wayfinding architectural criteria for the design of complex environments in emergency scenarios. In J. A. Capote, D. Alvear (eds.), *Evacuation and Human Behaviour in Emergency Situations – Advanced Research Workshop Proceedings* (pp. 209–222). Santander, Universidad de Cantabria, Spain.

- Ferati, A., Saidi, A. (2020). Organic vs Planned: The Evolution of The Spatial Configuration of Tetovo. *Journal of Applied Sciences-SUT*, 6 (11–12), 9–29. ISSN 2671–3047
- Grajewski, T. (1992). *Space Syntax Observation Manual* (2001 unpublished revised edition: L. Vaughan). London: UCL Bartlett and Space Syntax Ltd.
- Giovenale, AM. (2009). University Hospitals: the innovation of organizational models for integration among care, research and teaching. In R. Del Nord (ed.), *The culture for the future of healthcare architecture. Proceedings of 28th International Public Health seminar, Seminar Program*. Florence: Alinea editrice
- Haq S., Zimring C. (2003). Just down the road a piece – The Development of Topological Knowledge of Building Layouts. *Environment and Behaviour*, 35(1), 132–160. <https://doi.org/10.1177/0013916502238868>
- Haq, S., Hill, G., Pramanik, A. (2005). Comparison of Configurational, Wayfinding and Cognitive Correlates in Real and Virtual Settings. In Akkelies van Nes (ed.), *5th International Space Syntax Symposium*, 2, 387–405. Delft University of Technology: Techne Press.
- Hillier, B., Hanson, J. (1984). *The Social Logic of Space*. Cambridge: Cambridge University Press
- Hillier, B., Penn, A., Hanson, J., Grajewski, T., & Xu, J. (1993). Natural Movement: Or, Configuration and Attraction in Urban Pedestrian Movement. *Environment and Planning B: Planning and Design*, 20(1), 29–66. <https://doi.org/10.1068/b200029>
- Hillier, B. (1996). Cities as movement economies. *Urban Design International* 1(1), 49–60. <https://doi.org/10.1057/udi.1996.5>
- Hillier, B. (1999). Centrality as a process: accounting for attraction inequalities in deformed grids. *Urban Design International*, 3(4), 107–127. <https://doi.org/10.1057/udi.1999.19>
- Hillier, B., Iida, S. (2005). Network effects and psychological effects: A theory of urban movement. *Proceedings of the 5th International Space Syntax Symposium*. Delft: TU delft, 553–564.
- Krasniqi A. (2018). Qendra Klinike Universitare e Kosovës. *Fjalori enciklopedik i Kosovës: II. L-ZH* (pp. 1356 - 1357). Prishtinë: Akademia e Shkencave dhe e Arteve e Kosovës
- Lynch, K. (1960). *The image of the city*. Cambridge: The MIT Press
- Martinez, M. (2011). The need for an evidence – based toolkit. The spatial DNA of hospitals: evidence based planning and design. In N. Setola (ed), *Research tools for design. Spatial layout and patterns of users' behaviour. Proceedings e report 76* (pp.11–21). Florence: Firenze University Press.
- Mens, N. (2018). The building type and its emergence. In C. Wagenaar, N. Mens (eds), *Hospitals: a design manual* (pp. 65–66). Basel: Birkhauser Architecture
- Pellitteri, G., Belvedere, F. (2011). Humanization and Architecture in Contemporary Hospital Building. In P. Plowright, B. Gamper (eds), *Proceeding of the ARCC Spring Research Conference. Architectural Research Conference: Considering Research: Reflecting upon current themes in Architecture Research* (pp. 225–233). Southfield, MI: Lawrence Technological University
- Peponis, J., Zimring, C., Choi, Y. K. (1990). Finding the Building in Wayfinding. *Environment and Behavior*, 22(5), 555–590. <https://doi.org/10.1177/0013916590225001>
- Plani rregullues “Prishtina e Re – Zona perëndim” (2013). Accessed on 15 May 2019: <https://kk.rks-gov.net/prishtine/planifikimi-strategjik-dhe-zhvillimit-te-qendrueshem/planet-rregullative/>

- Jankovič, N. (1980). *Enti për Urbanizëm e Projektim*. Prishtinë: NGBG "Rilindja"
- Rossi Prodi, F., Stocchetti, A. (1990). *L'architettura dell'ospedale*. Firenze: Alinea Editrice
- Sadek, AH. (2015). A comprehensive approach to facilitate wayfinding in healthcare facilities. In K. Christer (ed), *Proceedings of the Third European Conference on Design4Health*, Sheffield, 13 - 16 July 2015. <https://doi.org/10.13140/RG.2.1.4195.7605>
- SHSKUK (2018). *Raporti i punës. Shërbimi Spitalor Klinik Universitar i Kosovës*. Accessed on 10 May 2019: <https://shskuk.rks-gov.net/Navbar/Index/23>
- Vaughan, L. (2001). *Space syntax observation manual*. University College London.
- Vujic I. (20.04.1956). [Tehnički opis objekata uz situaciju bolničkog centra u Prištini]. Sekretarijat za urbanizam i komunalnu delatnost Priština (Fund 71, no. 1367). Archive of the Municipality of Prishtina
- Wagenaar C., Mens N. (2018). *Hospitals: a design manual*. Basel: Birkhauser Architecture
- Watson D., Plattus A., Shibley R. (2003). *Time-Saver Standards for Urban Design*. New York: Mc-Graw Hill Professional