

CONFERENCE  
PROCEEDINGS

**3<sup>RD</sup> INTERNATIONAL  
ACADEMIC CONFERENCE ON  
PLACES AND TECHNOLOGIES**

EDITORS  
EVA VANIŠTA LAZAREVIĆ  
MILENA VUKMIROVIĆ  
ALEKSANDRA KRSTIĆ-FURUNDŽIĆ  
AND ALEKSANDRA ĐUKIĆ

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**PLACES AND TECHNOLOGIES 2016**

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Eva VaništaLazarević, Milena Vukmirović, Aleksandra Krstić-Furundžić, Aleksandra Đukić

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## **PLACES AND TECHNOLOGIES 2016**

KEEPING UP WITH TECHNOLOGIES TO CREATE COGNITIVE CITY  
BY HIGHLIGHTING ITS SAFETY, SUSTAINABILITY, EFFICIENCY,  
IMAGEABILITY AND LIVEABILITY

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## TABLE OF CONTENTS

### ARCHITECTURAL TECHNOLOGIES I – ENERGY ISSUES

DETERMINATION OF ENERGY CHARACTERISTICS OF TRANSPARENT ELEMENTS OF ENVELOPE OF RESIDENTIAL BUILDINGS IN BOSNIA AND HERZEGOVINA Darija Gajić	3
ECO-ENERGETIC RECONSTRUCTION OF ARCHITECTURAL STRUCTURES BY APPLYING MODERN FACADE TECHNOLOGIES Olja Joksimović, Katarina Vukosavljević	11
MODERNIZATION OF EXISTING GLASS FACADES IN ORDER TO IMPLEMENT ENERGY EFFICIENCY AND MEDIA CONTENT Jasna Čikić Tovarović, Jelena Ivanović Šekularac, Nenad Šekularac	19
EFFECTS OF WINDOW REPLACEMENT ON ENERGY RENOVATION OF RESIDENTIAL BUILDINGS – CASE OF THE SERBIAN BUILDING PRACTICE Ana Radivojević, Aleksandar Rajčić, Ljiljana Đukanović	27
GREEN ROOF RETROFIT POTENTIAL IN A DENSELY POPULATED BELGRADE MUNICIPALITY Katarina Vukosavljević, Olja Joksimović, Stevan Vukadinović	35
ENERGY REFURBISHMENT OF PUBLIC BUILDINGS IN SERBIA Milica Jovanović Popović, Miloš Nedić, Ljiljana Djukanović	43
PROBLEM OF PROTECTION OF ORIGINAL APPEARANCE OF PREFABRICATED CONCRETE FACADES AND ENERGY IMPROVEMENT MEASURES – EXAMPLE OF NEW BELGRADE Nikola Macut, Ana Radivojević	51
SUNLIGHTING: A BRIGHT LIGHT SOURCE FOR MULTI-STORY BUILDING CORES Liliana Beltran	59

### ARCHITECTURAL TECHNOLOGIES II - INNOVATIVE METHODS, SOFTWARE AND TOOLS

BIM AND GREEN BUILDING DESIGN: EXPECTATIONS, REALITY AND PERSPECTIVES Igor Svetel, Marko Jarić, Nikola Budimir	69
UNDER THE SKIN - DETERMINING ELECTRICAL APPLIANCES FROM SURFACE 3D SCANS Ulrich Krispel, Torsten Ullrich, Martin Tamke	77
ARCHITECTURAL DIAGRAM OF A CITY Olivera Dulić, Viktorija Aladžić	85
DIGITAL TOOLS - BASED PERFORMANCE EVALUATION OF THE ADAPTIVE BUILDING ENVELOPE IN THE EARLY PHASE OF DESIGN Komnen Žižić, Aleksandra Krstić-Furundžić	93

INCREASING QUALITY OF PLACE BY USERS VALUE ORIENTATION Alenka Temeljotov Salaj, Svein Bjorberg, Nikolaj Salaj	101
COMFORT QUALITY IN THE ARCHITECTURAL TRANSFORMATION OF EXISTING FACILITIES Saša B. Čvoro, Malina B. Čvoro, Una Umićević	109
<b>BUILDING STRUCTURES AND MATERIALS</b>	
CONCEPTUAL STRUCTURAL DESIGN STRATEGIES FOR REDUCING ENERGY CONSUMPTION IN BUILDINGS Aleksandra Nenadović, Žikica Tekić	119
COMPARISON OF THE SUSTAINABILITY OF DIFFERENT TECHNIQUES FOR THE STRENGTHENING OF REINFORCED CONCRETE COLUMNS Tanya Chardakova, Marina Traykova	125
THE ARCHITECTURAL ASPECT OF DESIGNING THE OFFICE ENVIRONMENT IN THE MULTIFUNCTIONAL BUILDING IN THE CITY CENTRE Anna Rynkowska-Sachse	133
MITIGATE THE HOUSING DEPRIVATION IN THE INFORMAL CITIES: MODULAR, FLEXIBLE AND PREFAB HOUSES Frabrizio Finucci, Adolfo Barrata, Laura Calcagnini, Antonio Magaro, Ottavio Minnella, Juan Martin Piaggio	141
AN EXAMPLE OF USING RECYCLED CRUSHED CLAY BRICK AGGREGATE: A PREFABRICATED COMPOSITE FAÇADE PANEL WITH THE FACE OF STONE Tijana Vojinović Čalić, Dragica Jevtić, Aleksandra Krstić-Furundžić	149
<b>CLIMATE CHANGE I – ENERGY ISSUES</b>	
ENERGY MAP OF KRAGUJEVAC AS AN INTRODUCTION TO THE ANALYSIS OF NECESSARY INTERVENTION MEASURES ON BUILDINGS IN ORDER TO ADAPT TO CLIMATE CHANGE Iva Poskurica Glišović	159
THE IMPACT OF CLIMATE CHANGE ON THE ENERGY PERFORMANCE OF HISTORICAL BUILDINGS Alexandra Keller, Cristian Petrus, Marius Mosoarca	167
INFLUENCE OF DIFFERENT PAVEMENT MATERIALS ON WARMING UP OF PEDESTRIAN AREAS IN SUMMER SEASON Jelena Đekić, Petar Đekić, Milena Dinić Branković, Mihailo Mitković	175
ANALYSIS OF ELECTRICITY GENERATION RESULTS OF FIRST MINI SOLAR POWER PLANTS IN THE SOUTH OF SERBIA WITH VARYING INCLINATION OF PHOTOVOLTAIC PANELS AND DIFFERENT ENVIRONMENTAL CONDITIONS Mihailo Mitković, Jelena Đekić, Petar Mitković, Milica Igić	183
EDUCATION NEEDS AND INFLUENTIAL FACTORS ON ENVIRONMENTAL PROTECTION IN FUNCTION OF SUSTAINABLE DEVELOPMENT AT HIGHER EDUCATION INSTITUTIONS Marijola Božović, Milan Mišić, Zorica Bogićević, Danijela Zubac	191

**BUILDING CLIMATE CHANGE II –  
STRATEGIES, PROTECTION AND FLOODS**

EVALUATING THE CO-BENEFITS OF FLOOD MITIGATION MEASURE – A CASE STUDY OF SOUTHERN YUNLIN COUNTY IN TAIWAN Yi-Hsuan Lin	201
FLOODING RISK ASSESSMENT IN MOUNTAIN VILLAGES—A CASE STUDY OF KAOHSIUNG CITY Ting-Chi Hsu, Han-Liang Lin	209
SPATIAL PLANNING IN VIEW OF FLOOD PROTECTION-METHODOLOGICAL FRAMEWORK FOR THE BALCAN COUNTRIES Brankica Milojević	217
CLIMATE WARS AND REFUGEES: HUMAN SECURITY AS A PATHWAY TOWARDS THE POLITICAL? Thomas Schad	225
LOW-IMPACT DEVELOPMENT STRATEGIES ASSESSMENT FOR URBAN DESIGN Yu-Shan Lin, Han-Liang Lin	235

**SUSTAINABLE COMMUNITIES AND PARTICIPATION I –  
PLANNING ISSUES**

THE POSSIBILITIES OF SURVEY AS A METHOD TO COLLECT AND THE DERIVE MICRO-URBAN DATA ABOUT NEW COLLECTIVE HOUSING IN SERBIA Branislav Antić	247
POSITION OF THE SOCIAL HOUSING ACCORDING TO THE URBAN PLANNING REGULATION OF THE CITY OF NIS – DO THEY PROMOTE THE INCLUSION? Nataša Petković Grozdanović, Branislava Stoiljkovic, Goran Jovanović	255
INFLUENCE OF DIFFERENT APPROACHES IN DEVELOPMENT OF LOCAL RESIDENTIAL BUILDING TYPOLOGIES FOR ESTIMATION OF BUILDING STOCK ENERGY PERFORMANCE Milica Jovanović Popović, Dušan Ignjatović, Bojana Stanković	263
TOWARDS A LOW-CARBON FUTURE? CONSTRUCTION OF DWELLINGS AND ITS IMMEDIATE INFRASTRUCTURE IN CITY OF SPLIT Višnja Kukoč	271
SCENARIOS IN URBAN PLANNING AND THE MULTI-CRITERIA METHOD. A MEANINGFUL EXPERIENCE IN ITALY: PIANO IDEA IMPLEMENTED IN JESI AN,2004 Giovanni Sergi, Paolo Rosasco	279
THE PUBLIC INSIGHT AND INCLUSIVITY IN THE PLANNING PROCESS Nataša Danilović Hristić, Nebojša Stefanović	287
TOWARD THE SUSTAINABLE CITY – COMMUNITY AND CITIZENS INCLUSION IN URBAN PLANNING AND DESIGN OF URBAN GREEN SPACES: A REVIEW OF SKOPJE Divna Penčić, Snezhana Domazetovska, Stefanka Hadji Pecova	295

## **SUSTAINABLE COMMUNITIES AND PARTICIPATION II – CONCEPTS, METHODS AND COMMUNITY**

HOW TO DEVELOP AND DESIGN HEALTHY URBAN ENVIRONMENT? Sanja Štimac, Anja Jutraž	305
SUSTAINABILITY AND BROWNFIELD REGENERATION Kristina Azarić	313
THE SOCIAL DIMENSION OF A SUSTAINABLE COMMUNITY: UNDERSTANDING OF THE EXISTING SPACE Silvia Grion, Elisabeth Antonaglia, Barbara Chiarelli	319
HOW TO UNDERSTAND THE GLOBAL PHENOMENON OF URBAN SHRINKAGE AT LOCAL LEVEL? COMPARISON OF URBAN AREAS IN ROMANIA AND SERBIA Mihai-Ionut Danciu, Branislav Antonić, Smaranda Maria Bica	327
SPATIAL PATTERNS OF SERBIAN MIGRANTS IN VIENNA AND IN THE SETTLEMENTS OF THEIR ORIGIN IN EASTERN SERBIA Branislav Antonić, Tamara Brajović	335
KEEPING THE CITY LIVEABLE FOR INHABITANTS AND EFFICIENT FOR TOURISTS: THE PILGRIMAGE ROUTES Lucia Martincigh, Renata Bizzotto, Raffaella Seghetti, Marina Di Gauda, Giovanni Perrucci	347
ENVIRONMENTAL PROBLEMS AND CITIZEN PARTICIPATION IN MEDIUM-SIZED TOWNS OF SERBIA Anđelka Mirkov	355
URBAN PROBLEMS OF HILLY AND MOUNTAINOUS RURAL SETTLEMENTS IN NIŠ MUNICIPALITY Milica Igić, Petar Mitković, Jelena Đekić, Milena Dinić Branković	361

## **IMAGE, IDENTITY AND QUALITY OF PLACE I – PLANNING ISSUES**

THE STRATEGIES OF PLACE-MAKING. SOME ASPECTS OF MANIFESTATIONS OF POSTMODERN IDEAS IN LITHUANIAN ARCHITECTURE Martynas Mankus	373
DESIGNING CENTERS OF SUBURBAN SETTLEMENTS IN THE POST-SOCIALIST CITY – NIŠ CASE STUDY Milena Dinić Branković, Jelena Đekić, Petar Mitković, Milica Igić	381
TRANSITION AND THE CITY: TRANSFORMATION OF URBAN STRUCTURE DURING THE POST-SOCIALIST PERIOD Dejana Nedučin, Milena Krklješ	389
POST INDUSTRIAL CITIES: CREATIVE PLAY - FAST FORWARD BELGRADE 2016 Eva Vaništa Lazarević, Marija Cvetković, Uroš Stojadinović	395
THE FUTURE OF OLD INDUSTRIAL AREAS - SUSTAINABLE APPROACH Anica Tufegdžić, Maria Siladji	405

CREATING IDENTITY AND CHARACTER OF NEW SETTLEMENT FORMED DUE TO GROWTH OF THE CITY- ON THE EXAMPLE OF PODGORICA Ema Alihodžić Jašarović, Edin Jašarović	413
SPINUT-POLJUD RESIDENTIAL AREA IN SPLIT, CROATIA Vesna Perković Jović	421
IMAGE, IDENTITY AND QUALITY OF ZAPRUĐE HOUSING DEVELOPMENT IN NOVI ZAGREB Ivan Milnar, Lea Petrović Krajnik, Damir Krajnik	429
URBAN IDENTITY OF BORDER SPACES. CONSTRUCTING A PLACE IN THE BORDER CROSSING BETWEEN SPAIN AND MOROCCO IN CEUTA Belen Bravo Rodriguez, Juan Luis Rivas Navarro, Alicia Jiménez Jiménez	435
ZEITGEIST & GENIUS LOCI: TRADE VALUE AESTHETIC AND WEAKNESS OF AUTHOR'S IDENTITY IN RECENT SERBIAN ARCHITECTURE Aleksandar Kadijević	445
 <b>IMAGE, IDENTITY AND QUALITY OF PLACE II – PUBLIC SPACES</b>	
PRESERVING PLACE MEANING IN FUNCTION OF TRANSFORMATION OF OPEN PUBLIC SPACES Ana Špirić, Sanja Trivić	455
STREET LIFE DIVERSITY AND PLANNING THE URBAN ENVIRONMENT. COMPARATIVE STUDY OF SOFIA AND MELBOURNE Silvia Chakarova	463
TRANSFORMATIONS AND PERMANENCE OF REPUBLIC SQUARE Stefan Škorić, Milena Krklješ, Dijana Brkljač, Aleksandra Milinković	473
THE IMAGE OF THE CITY VS. SEMI-PUBLIC SPACES OF SHOPPING MALLS: CASE STUDY OF BELGRADE Marija Cvetković, Eva Vaništa Lazarević	481
THE MARKET HALL OF PÉCS Balazs Kokas, Hutter Ákos, Veres Gábor, Engert Andrea, Greg András, Sike Ildikó, Alexandra Pető	489
INNOVATIVE PUBLIC SPACE REHABILITATION MODELS TO CREATE CONDITIONS FOR COGNITIVE - CULTURAL URBAN ECONOMY IN THE AGE OF MASS INDIVIDUALISATION Katarzyna Bartoszewicz, Piotr Lorens	497
ILLUMINATION OF FACADES OF PUBLIC BUILDINGS IN NOVI SAD AND ITS IMPACT ON SPATIAL PERCEPTION Dijana Brkljač, Milena Krklješ, Aleksandra Milinković, Stefan Škorić	507
COGNITIVE PERFORMANCES OF PEDESTRIAN SPACES Milena Vukmirović, Branislav Folić	515



### **IMAGE, IDENTITY AND QUALITY OF PLACE III – CONCEPT, METHODS, EDUCATION**

THE CRIMINAL CITY: URBAN RESET AFTER "COLECTIV" Agelica Stan	527
TOWARD THE ULTIMATE SHAPE-SHIFTER: TESTING THE OMNIPOTENCE OF DIGITAL CITY Aleksandra Stupar, Tatjana Mrđenović	535
MANAGEMENT OF URBAN IMAGE AS A TOOL FOR PLANNING. THE CASE OF THESSALONIKI Kleoniki Gkioufi, Eleni Gavra	541
VISIBLE AND INVISIBLE PROCESSES AND FLOWS OF TIME-SPACE OF ARCHITECTURAL AND URBAN CONTINUITY OF THE CITY Velimir Stojanović	549
FORMS OF CONTINUITY IN ARCHITECTURAL SPACE Petar Cigić, Milena Kordić	555
URBAN DESIGN EDUCATION FOR PLACEMAKING: BETWEEN COGNITION AND EMOTION Jelena Živković, Zoran Đukanović, Uroš Radosavljević	565
SKETCHBOOK AS AN ARCHITECTURAL DESIGN INSTRUMENT OF THE COGNITIVE CREATION PROCESS FOR THE QUALITY OF PLACE Igor Rajković, Uroš Radosavljević, Ana Zorić	573
THE MUSICALITY OF UNDULATING GLASS PANES IN THE CONVENT OF LA TOURETTE Marko Slaviček, Anja Kostanjšak	581
THE ROUTES OF DIGITALIZATION – FROM REAL TO VIRTUAL CITY AND VICE VERSA Miodrag Ralević, Tatjana Mrđenović	587
<b>RESILIENCE OF PLACES</b>	
A SHRED OF PLACE IN A DIGITAL ERA HUMANITARIAN DISASTER Pavlos Lefas, Nora Lefa	599
URBAN SPACES MORPHOLOGY AND MICROCLIMATE CONDITIONS: A STUDY FOR A TYPICAL DISTRICT IN THESSALONIKI Stella Tsoka, Katerina Tsikaloudaki, Theodoros Theodosiou	605
SPONTANEOUS DEVELOPMENT AND RESILIENCE PLACES – A CASE STUDY OF ELECTRONIC INDUSTRY NIS (SERBIA) Liljana Jevremović, Branko Turnsek, Aleksandar Milojkovic, Milanka Vasic, Marina Jordanovic	613
SUSTAINABLE MODEL FOR REGIONAL HOSPITALS IN HUMID TROPICAL CLIMATE Nataša Čuković Ignjatović, Dušan Ignjatović, Dejan Vasović	621

MATERIAL AND COGNITIVE STRUCTURES OF BUILDINGS AND PLACES AS INTEGRATED PATTERNS OF PAST, PRESENT AND FUTURE Dženana Bijedić, Rada Cahtarevic, Mevludin Zecević, Senaida Halilović	627
BOOSTING THE RESILIENCE OF THE HEALTHCARE SYSTEM IN BELGRADE: THE ROLE OF ICT NETWORKS Jelena Marić, Aleksandra Stupar	635
INTERCONNECTION OF ARCHITECTURE AND NEUROSCIENCE - RESHAPING OUR BRAINS THROUGH PHYSICAL STRUCTURES Morana Pap, Mislav Pap, Mia Pap	645
THE POTENTIAL OF URBAN AGRICULTURE IN REVITALIZATION OF A METROPOLIS Gabriela Rembarz	651
<b>ADAPTIVE REUSE</b>	
IMPROVING STRATEGIES FOR FUNCTIONAL UPGRADE FOR AN "INTEGRATED REHABILITATION" Francesca Guidolin	661
ADAPTIVE REUSE AND SOCIAL SUSTAINABILITY IN THE REGENERATION PROCESSES OF INDUSTRIAL HERITAGE SITES Sonja Ifko, Ana Martinović	669
REVEALING THE MONTENEGRIN KATUN AS A PLACE OF REUSABLE COGNITIVE TECHNOLOGIES Edin Jašarović, Ema Alihodžić Jašarović	683
INTERSECTIONS OF NOW AND THEN; IMPLEMENTATION OF ADAPTIVE REUSE AS CATALYST OF SPACE TRANSFORMATION Anja Kostanjšak, Nikola Filipovic	691
MULTIFAMILY HOUSING IN BELGRADE – ENERGY PERFORMANCE IMPROVING POTENTIAL AND ARCHITECTURAL CHALLENGES Nataša Ćuković Ignjatović, Dusan Ignjatovic, Bojana Stankovic	699
SPATIAL STRUCTURE OF THE SUBURBAN ZONES IN SELECTED ENTREPRENEURSHIPS NESTS OF THE TRICITY METROPOLITAN AREA Grzegorz Pęczek, Justyna Martyniuk-Pęczek	707
<b>INNOVATIVE METHODS AND APPLICATIONS FOR SMART(ER) CITIES</b>	
TECHNOLOGY AS A MEDIATOR BETWEEN MAN AND CITY IN THE CONTEXT OF CONTEMPORARY CHALLENGES Katarina Stojanović	725
CITY INTELLIGENCE INFORMATION MODELING Alice Pasquinelli, Silvia Mastrolembro, Franco Guzzeti, Angelo Ciribini	731
AN INTRODUCTION TO THE PHYSICAL PLANNING INFORMATION SYSTEM OF CROATIA AND NEW GENERATION OF SPATIAL PLANS Sunčana Habrun, Lidija Škec, Danijel Meštrić	739

THE CONCEPT OF SMART ARCHITECTURE IN SERBIA – ONE BELGRADE EXPERIENCE Dragan Marčetić, Andrej Josifovski	747
THE IDEA OF COGNITIVE CITY - A CHALLENGE FOR NEW TECHNOLOGY TO PROMOTE HEALTH Aleksandra Krstić Furundžić, Nikola Z. Furundzić, Dijana P. Furundzić	755
MIXED REALITY ENVIRONMENT AND OPEN PUBLIC SPACE DESIGN Aleksandra Đukić, Dubravko Aleksić	761
VULNERABILITY OF PUBLIC SPACE AND THE ROLE OF SOCIAL NETWORKS IN THE CRISIS Milena Vukmirović, Miroslava Raspopović	769
NEUTRAL GROUNDING POINTS WITHIN THE GENERAL DISTRIBUTION SYSTEM AS AN ELEMENT OF ENVIRONMENTAL PROTECTION Zorica Bogičević, Slobodan Bjelić, Bojan Jovanović, Milan Misic	779
THE ROLE OF COGNITIVE – CULTURAL ECONOMY IN CITY’S GLOBAL POSITIONING Sanja Simeunčević Radulović, Biserka Mitrović	789
<b>URBAN MOBILITY, TRANSPORT AND TRAFFIC SOLUTIONS</b>	
THE CONTRIBUTION OF ITS TO THE SAFETY IMPROVEMENT OF VULNERABLE ROAD USERS Bia Mandžuka, Ljupko Šimunović, Pero Škorput	799
BUILDING ENVIRONMENTAL PERSPECTIVE OF AIRCRAFT OPERATIONS AROUND BELGRADE NIKOLA TESLA AIRPORT Olja Čokorilo, Ivana Čavka	805
TRANSPORT PROJECTS AND PUBLIC PARTICIPATION Davor Brčić, Stjepan Kelcec-Suhovec	813
DISLOCATION OF THE EXISTING RAILWAY AND BUS STATION IN THE CITY OF KUMANOVO AND THEIR INTEGRATION INTO A TRANSPORT HUB WITH ADJOINING CONTENTS Mihajlo Zinoski, Medarski Igor, Stefani Solarska	817
THE IMPACTS OF TRANSPORT INFRASTRUCTURES ON URBAN GEOGRAPHY Federico Andrea Innarone	825
LIQUID LIFE: A RELATIONSHIP BETWEEN VULNERABILITY AND MOBILITY – THE CONSEQUENCES FOR A SUSTAINABLE CITY, StevanTatalović	831

## COGNITIVE PERFORMANCES OF PEDESTRIAN SPACES

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### ABSTRACT

If the city and its physical structure are understood as some kind of an extended, external memory of the human mind, two aspects are observable. The first relates to the characteristics of the city and its places to help in the orientation and way finding of its citizens and visitors. They could be explored through mental or cognitive maps. The second aspect includes the elements involved in generating the image and identity of the city. Looking at the pedestrian space as an environment that achieves the most intimate relationship of users and the city, the paper would present the elements that can be seen as cognitive performances of pedestrian spaces. They will be analysed at the area of the City of Belgrade, central pedestrian network with the aim to identify existing and to propose future of the proposals elements that will contribute to its extension and intensive use.

**Keywords:** pedestrian spaces, communication, cognitive performances, City of Belgrade

### INTRODUCTION

By observing the communication from the aspect of culture, every cultural phenomenon could be seen from the communicational perspective, i.e. as model or way of communication (Tomić 2003, 12). This is also the case with a pedestrian space. In contrast to the non-verbal communication, pedestrian space has cognitive dimension that is not based solely on interaction. In regards with this, it was noticed that people their physical environment<sup>2</sup> associate with connotations that are more frequent subject of research.

According to IRN<sup>3</sup>, cognitive system in general and the one associated with cognitive maps extends beyond the individual mind in the external environment. This could be explained by the fact that the cognitive system is a network made up of internal and external representations. *Internal representations* are related to entities, constructed in the human mind, which represent the information (visual, olfactory, language, etc.) from the external environment. On the other hand, external representations refer to entities created on the basis of human mimetic, linguistic and manufacture capabilities that represent the information generated in the mind. They are

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<sup>2</sup> Landscape, cities of other geographical phenomena

<sup>3</sup> Inter-Representational Network (IRN)

products of human abilities to represent the ideas, emotions and thoughts externally and can be divided on body and artificial representations. In contrast to body representations, which cannot extend outside the body, the artificial ones expand outside the human body and become independent artefacts (objects).

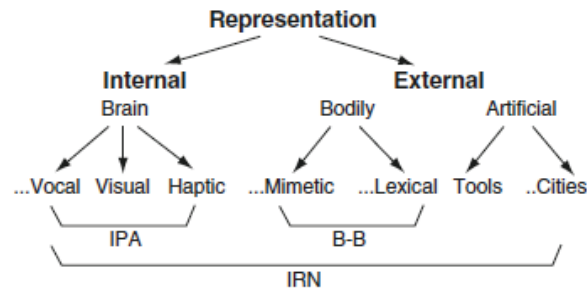


Figure 1: Human representative abilities (Portugali 2011, 142)

By observing the pedestrian space on presented way, the model of synergetic inter-representative network - SIRN (Portugali 2011, 142) 1) establish the relations on the basis of official selforganising mediator that is a subject of the operation of two streams of information (internal and external) and 2) explains the ways in which performances are entered into the external world (the city) and the ways people understand them (as intermediaries). In accordance with that, the result of the SIRN is two fields of information – internal and external. Each of these fields is accessible and legible to its creator. However, the field of the external information is also accessible and legible to other people. Thus, the interaction of internal and external information is called a *common reservoir* and can take forms like text, Internet, objects or entire cities. Therefore, the city users with their activities and behaviour define the city<sup>4</sup>.

This paper covers three parts. The first part is dealing with the general presentation of the communication of urban environment with the focus on its cognitive dimension. In the second part the specificity and physical characteristics of the pedestrian space network, as a communicational instrument will be presented. And in the third, the case study of pedestrian network in Belgrade central area will be used as an illustration of the presented findings.

## COMMUNICATION OF THE PEDESTRIAN ENVIRONMENT

Walking is the most intimate with the environment and allows much more articulate processes of interpretation and memory (Madanipour 1996, 64-65). Observing the architecture and urban design as a visual art, Cullen (1971, 194) is focusing on personal and emotional reactions of the urban environment, because they are “captured” by sense of sight. He was presented the series of visual techniques that was used to show the walk through the environment by capturing current and future views of the observer during the motion. These findings are supplemented by the understanding of the position of the body in the environment, its awareness of the space and the mood and the character of the individual. However, the disadvantage of this approach is seen in the fact that the urban environment is exercised the stimulus other senses, especially if one takes into account pedestrian movement.

In order to form a humane approach to urban form, theorists have been searched for an image of the city and its legibility. The technique that was used in the study of ways that people remember

<sup>4</sup> In the language of synergetic this process is called **circular causality**, while in social theory, the same term is known as **socio-spatial reproduction** and **structuring** (Portugali 2011, 164).

the environment is mental mapping, i.e. detection of mental images created by the individuals when uses the city (Madanipour 1996, 66). Interested in the visual quality of American cities represented in the mental maps of its citizens, Lynch (1979) has distinguished five elements of the image of a city: paths, edges, nodes, landmarks and districts. It was noted that the cities in which the five elements are clearly observed offer much more than a visual pleasure, but emotional security, because they increase the depth and intensity of human experience.

Golledge (1978) has concluded that people first remember locations with landmarks, then come the links between locations and at the end areas as a surrounding of the locations. This resulted in the determination of three or four elements that affect the level of legibility of the city: points, lines, areas and surfaces. Accordingly, the knowledge of the environment acquired during the physical movement cover recording parts of the network structure (planned or strip-folders) and cognitive processing and storage of knowledge gained from observations made during the movement and path finding. Other studies suggest that people, instead of the subtle factors of design, are also interested in what is happening in a certain area. Thus the importance is given to the specific use of a certain area.

Potugali (2011, 199) noticed that the face of the city os formed by elements – external representations – that have the ability to encompass and transfer the information – Shannon and semantic. Shannon information has the information capacity of the communication channel, regardless of the quality or meaning of information. On the other sode, semantic information refers to the meaning that is transmitted through representation of the experience specific receiver. Thus, in addition Lynch’s five elements, there are also other buildings, streets, parks, etc. The difference between them is reflected in the quantity of information they contain, and are thus more or less important for the legibility of the city. Accordingly the face of the city is the message that transmits different level of Shannon’s information which depends on semantic information. And, that is how people cognitively and actively give the meaning to the elements from which the city is made, as well as the city as whole.

By detailed research of the face of the city, another way of analysing the semantic information is established. This is the observation of urban artefacts as unique and redundant (see table 1). Unique artefacts are elements in the environment that carry high value Shannon’s information, and because of that it are easy to remember them. As a result, unique artefacts are much more intensively involved in shaping the face of the city. However, among them, it could be made a difference in relation to the character of the semantic information that defines the source of the uniqueness of particular element. Based on that, they are divided into geometric, symbolic and legendary unique artefacts. Redundant artefacts include those items which, due to their multiplicities and repetition, form categories with different characteristics. A convenient way to make a difference among them is the establishment of a category in relation to the scale. Thus four subtypes are distinguished and they include urban furniture, buildings, urban scenes and street network.

**Table 1: Urban artefacts: Unique vs. Redundant (Portugali 2011)**

UNIQUE ARTEFACTS	Geometric uniqueness
	Symbolic uniqueness
	Legendary uniqueness
REDUNDANT ARTEFACTS	Urban furniture
	Buildings
	Urban scenes
	Street network



Destinations are the places with the greatest intensity of users and correspond to the places that are located at the corners of the streets, main public spaces or dotted along the paths. On the other side, connections, function as water canals and correspond to the streets in which the most of the movement takes place.

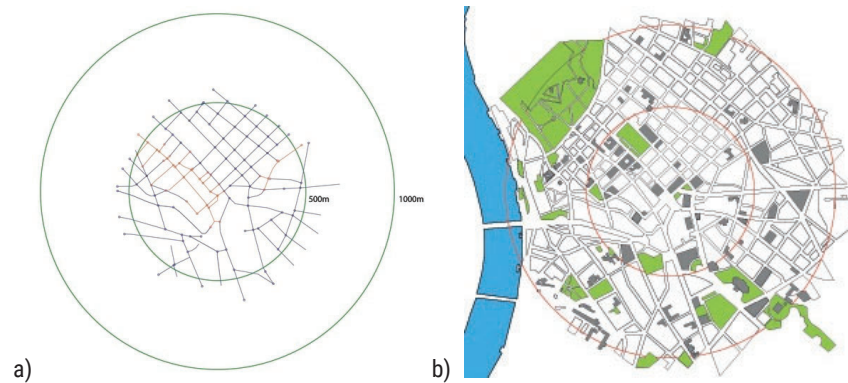
Connections and destination are analysed in relation to the spatial coverage determined by the value of acceptable length/duration of walking. It is determined by unit of time (15 minutes) or the unit of length (up to 1,000m). Thus reasonable walking length determine the walking area, which corresponds to a square mile, or 1km<sup>2</sup> and in relation to walking we are interested in places that generate the highest level of life in open public spaces. Thus, the most successful urban areas could be analysed on different scales, but their common characteristics are that they could be reached in 10 minutes walk and that they have a large number of intersections (Montgomery 1998). The most successful urban areas cover an area of about 1km<sup>2</sup> and have about 250 intersections, sometimes much more<sup>6</sup> (Jacobs 1995).

On the other side, the experience of the city as well as pedestrian space corresponds to the area covered by the frame of sight of pedestrians, which has its optimum width, height and depth. Pedestrian frame of sight could be also characterised as its sensory field, because this space is rich of stimuli that acts on other senses, through which it is possible to achieve a significant effect on the formation of experience. The sight, determined by pedestrian field of view provides an overview of the existence of landmarks that are associated with the beginning and end paths intense interaction with the environment in the immediate vicinity. Thus the face of the city that is displayed to pedestrian covers also unique and redundant urban artefacts.

Considering the elements of cognitive maps that show the key elements of the physical structure of the city, as well as the character of the unique and redundant urban artefacts, cognitive performances of the pedestrian network will be analysed on the city level on the case study of pedestrian network of the City of Belgrade central area.

### CASE STUDY BELGRADE

The pedestrian network in the Belgrade city centre covers the area of 0.79m<sup>2</sup> that is 0.22% of the total surface of the city. On that polygon it was identified 13.718m of vehicle routes and 2.781m of paths that are pedestrian only. Considering the mentioned lengths of the paths and by comparing the relation between them, there is a conclusion that the ration of 5:1 in favour of vehicle routes.



**Figure 3: The pedestrian network in Belgrade city centre \_ a) Paths and intersections and b) Attractors.**  
Source: Vukmirovic

<sup>6</sup>Amsterdam 600, Toulouse 330, Mayfair in London 420, etc.



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The network is formed of 40 vehicular and 19 pedestrian paths whose traverse creates 112 intersections (see Figure 3a). Compared with the optimal number of intersection of 250, it is concluded that there are 138 intersections less than necessary.

By an examination of the strip-map of Belgrade (see Figure 4) it was found that the area covered by the imaginary circle of 500m in radius includes 27 attractors, distinct to the space of 1000m in radius where 71 attractors are mapped (see Figure 3b). Besides the objects that have been noted as unique artefacts (geographic, symbolic or legendary), there are buildings that are protected cultural monuments. The buildings of great importance for the Republic of Serbia at the research polygon are Belgrade's Fortress, Dositej's Lyceum (Dositejev licej), Captain Misa's Mansion (Kapetan Misino zdanje), Princess Ljubica's Residence (Konak kneginje Ljubice) and the Congregational Church (Saborna crkva) (Универзитет у Београду, Шумарски факултет и Институт за архитектуру и урбанизам Србије 2012, 21). In addition, there are also allocated a dozen of monuments of big importance<sup>7</sup> and dozens of cultural monuments<sup>8</sup>.



Figure 4: Belgrade city centre strip map. Source: Mia Luzajic

Belgrade tourist map presented at the Trip advisor's web portal shows 67 localities that have been identified as Belgrade's attractions allocated by the visitors. The most selected of all the mentioned attractions is Belgrade's Fortress (see Figure 5). Other locations that visitors have been singled out are Republic Square, followed by Skadarlija (3), Church of St. Petka (4), Knez Mihailova Street (6), National Theatre (8), the Danube (11), Belgrade Zoo (14) Congregational Church (17), the Church of the Holy Mother of God (18) Dorćol (20) and Princess Ljubica Residence (24).



Figure 5: Belgrade's Fortress – the most selected attraction by the visitors. Source: Serbia4Youth

<sup>7</sup> Bajrakli džamija, Jevrem Grujić's home, Narodna banka, National museum, Moskva hotel, National theatre, etc.

<sup>8</sup> Agrar bank, Balkan ciname, Ćukur Ćesma, Mika Alas's home, Ethnographic museum, Ruski car cafe, Iguman's palace, Cafe ?, etc.

Diagram created by Eric Fischer shows which parts of the wider area of Belgrade are the most visited by tourists. It clearly shows the path of Knez Mihailova Street, Terazije and Republic Square, the area around the Princess Ljubica's Residence and the Congregational Church and the path of Paris streets with the upper part of the Belgrade Fortress (see Figure 6). In addition to the isolated location, the movement takes place in the wider area of the mentioned places and extends towards the Danube and the Sava waterfronts and along the Boulevard of King Alexander.

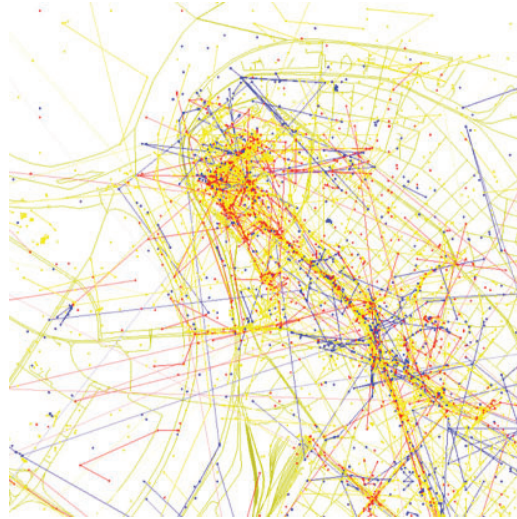


Figure 6: Belgrade \_ Locals vs. Tourists. Source: Eric Fisher

The results of the analysis (see Figure 7) of the research area have shown that there is no unique content that dominates the location, i.e. defines the character it. They also has shown that within the selected network of pedestrian spaces the most frequent are cafes (30 in the radius of 500m or 47 within a radius of 1,000m), on the second place are restaurants (13 in a radius of 500m, or 23 in a radius of 1,000m) and the third are banks (a total of 15 banks within a radius of 1,000m). Cinemas and major retails are the least present at the location.

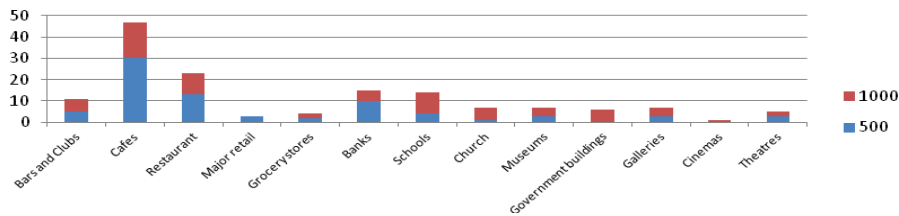
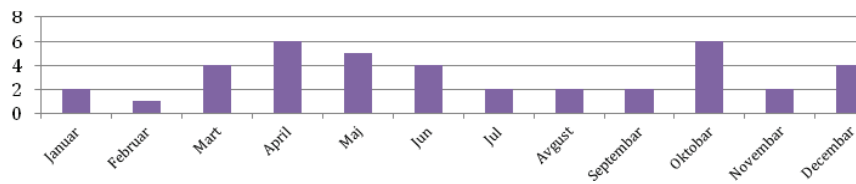


Figure 7: Contents present at the research location. Source: Vukmirovic

During the year, 40 public events are happening at the location covered by the network of pedestrian spaces in the city centre (Vukmirovic 2013). Considering the period when they occur at the monthly basis (see Figure 8), the largest number of the events (6) is held in April and October. On the other side, the lowest number of the events took place during the February (1), January, July, August, September and November (2).

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**Figure 8: Belgrade \_ Distribution of the major events during the year. Source: Vukmirovic**

In accordance to their thematic category, the most of the events belongs to the category of art and design (16) followed by the category of music and dancing (6). The most of them has decades long tradition like Belgrade Summer Festival (BELEF), International gathering of the children from Europe, Belgrade Music Festival (BEMUS), October salon, The May Exhibition, Belgrade Jazz Festival, etc. In addition to the mentioned events in the field of culture, the past few years has triggered by the developments of design events such as Belgrade Design Week festival Mikser, Resonate festival, etc. By keeping regular the occurrence Belgrade Fashion Week aims to present the Belgrade fashion scene - young less-known authors and those who have already positioned on the local fashion scene.



**Figure 9: Belgrade public events: BELEF, Days of Belgrade, Belgrade fashion week and civil protest**

In addition to the mentioned, Belgrade is also known by the events organised in the form of political protests (demonstrations, engaged performances, carnival celebrations, etc.) that have occasionally occurred in late XX and early XXI century. Because of that, the city is represented as the capital of historical initiatives in terms of organised mass protests and strong civic passions of social action. The most common gathering for political purposes happened at Republic Square and Plateau in front of the Faculty of Philosophy in Belgrade.

## CONCLUSIONS

On the basis of the presented results it could be defined general recommendation that need to be implemented in order to improve the quality of the network of pedestrian spaces in the Belgrade central area with the special attention paid on the cognitive performances of the pedestrian space seen from the city level. This need to be done simultaneously, in the domain of physical as well as in the functional domain, because they both participate in the creation of the pedestrian experience.

Having in mind the complex character of cognitive maps that include the most important elements of the physical as well as functional character of the city understood as unique and redundant artefacts the recommendations for the network of pedestrian spaces in the city of Belgrade include:

- The correction of the ration between pedestrian and vehicle paths in favour of pedestrian routes
- Increasing the number and balanced distribution of urban attractors

- Stimulation of the appearance of contents that increase the attractiveness and usage period of pedestrian/public space
- Gradual expansion of pedestrian routes and the intensity of everyday movement in pedestrian area.
- Establishing balanced relations between events that aim to generate a collective and cultural identity with events that represent the city.

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