Understanding and interpreting urban space (in)formation
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This paper introduces a novel approach to understanding the complex information and logics of urban spaces by the non-professional public. A model for Interpretation of Qualities in Urban Space (aMIQUUS) is proposed. The objectives are threefold: first, to form common, valid and applicable measures to assess features of space design; second, to indicate the developmental trait that considerably affect users’ spatial experience which - taken as a consequence - derives from either sustainable/prudent or poor design decisions; and third, to generically recreate and visually represent urban spaces for communicative purposes. The model represents an identification method, not a problem-solving mechanism and is intended as a pragmatic instrument for recognizing crucial information, narrative, embedded in spatial scene. Model is followed by the initial idea to extend it in terms of an educational digital interface for the general public, participating in the process of urban decision-making. The paper Concisely summarizes both theoretical and applicative efforts.

Keywords: spatial information, interpretation model, public participation, sustainable design, spatial qualities.
I. INTRODUCTION

Starting from a lack of suitable tools for interpreting the complex information and multifaceted nature of the urban environments, in terms of the nonprofessional target public, we framed a mechanism, namely a model (aMIQUUS - A Model for Interpretation of Qualities in Urban Space) to demonstrate and interpret the distinctive spatial features that contribute significantly to the quality of the built environments. The model proposed comprises a mechanism to bridge the expert and lay public reasoning, perceptions, and further their comprehensions concerning the information of urban space, its quality and design, as a precondition to improve communication between these two groups that has increasingly been involved together in the process of urban decision making. Three interrelated prospects of the model can be highlighted - first, the initial concept that seeks for a cross-section between the professional and lay public's interpretation of the information relating to particular urban place, second, the idea of bringing the more abstract (professional) and the more tangible (user-comprehensible) notions characterising a particular place to a common denominator, and third, the idea of transmitting the nominated information of the first and the second point into a visual language, that can be both, “written” or prepared by the professionals and “read” or understood by the non-professionals. The whole mechanism therefore deals with two issues: a) the issue of suitable spatial contents/information within the urban design domain to be communicated between the professional and nonprofessional public, and b) the issue of suitable visual language for representing this contents/information. In other words, the subject to be communicated between the expert and nonprofessional public and the means/techniques of communication can be underlined at this point. We claim that subtly confined subject, which could be “information, data and knowledge”, including the cause-effect relationships at the selected spatial scale, can contribute to the enhancement of the comprehensions of spatial complexities by the lay public and encouraging its communication with the expert public. By that we, as expert public, long-termly strive towards developing common priorities regarding spatial values and design tendencies.

In terms of identifying the urban qualities, achieving them, and explaining the principles of high quality urban design approaches, a large body of literature and research in different spatial disciplines has evolved, whilst reflecting the agenda set by Lynch [1], Jacobs [2], Rapoport [3], Cullen [4] or Alexander [5] amongst many others. Urban designers, architects and researchers have developed a rich array of design evaluation approaches [6], that have proved the continuation of extensively recognized but abstractly defined merits, such as visual order, enclosure, imageability, human scale, clarity, continuity etc.; however, the description and specification of these are rarely entirely clear, cohesive or unified, and lack the traceable linkage to the actual and elementary features of urban space. Bringing such abstract,
aggregated and indefinite measures, information and the corresponding terminology (also its mental or visual representation) into the dialog of urban decision-making raises relevant doubts concerning the reciprocal comprehension between the expert and the non-expert public.

For this reason our attempt was to approach the conceptualised information and representation of the professional message from the opposite side, closer to lay public and its tacit knowledge and experiences. With this in mind, the information can be understood through the spatial quality, which represents a meaningful concept only when related to an actual definition of space use [3], and the main challenge is, then, to create an insight into the space structure from the perspective of users’ daily experiences - this is how a specific place accommodates the user’s needs - and further the question of how these can be linked back to the conceptualised description of this same place and its attributes and demonstrated with the tangible/experiential means of representation. The described challenges were carried out within the established model aMIQUS in terms of conceptual, technical and applied dimensions.

The present paper summarizes the essential phases of our research work and unfolds the arguments in three steps. We begin with a short introductory section explaining the background of spatial decision-making and communicating interdisciplinary spatial contents to general public. Second part reveals the initial premise and logic underlying the model aMIQUS. The third part provides an insight into the model reasoning, its structure, methods used, as well as its main advantages and constraints.

2. COMMUNICATING INTERDISCIPLINARY SPATIAL INFORMATION TO GENERAL PUBLIC

Addressing the issues of sustainable urban design and democratic planning process, including participatory approach in decision-making, is not tied to a single professional or academic domain, but rather to several domains. As Gehl [7] points out the spaces between buildings are of vital importance for the quality of urban space both physically - in terms of the design of the streets, parks, squares, its form and furniture that make up the public realm - and in terms of the social qualities of those spaces - their safety, accessibility and vitality. Thus, architecture, engineering, environmental psychology, geography, sociology are few of those disciplines that contribute to clarifying questions that arise in relation to altering the system of the built environments and their intertwineements. However, as Batty et al. [8] states, the knowledge involved in the urban design process is never the prerogative of any single expert, and even more, the knowledge in these terms is crucially and closely linked with the living quality of the society, thus, public consensus is essential for the implementation of any design idea.

When it comes to the communication between professional and the general public, in an attempt to involve the broader general public in the
decision-making process, one is quickly encountered with the problem of insufficient understanding between these two groups. We are often faced with the Gordian knot of questions deriving from diverse types of skills, different priorities, values, attitudes, educational backgrounds, and motivation for participation, etc. Especially the role of education and common priorities concerning spatial qualities and sustainable development are a strong factor in bridging the gap between the expert and lay public reasoning [9]. The social and psychological science literature provides us with evidence about the kinds of values and knowledge people actually bring to bear in making decisions and also about the impact of formal/informal education, norms, needs and other external influences on one’s comprehension of spatial reality. It is recognized [10] that profound acquaintance with spatial complexity can arouse rational reasoning and gradually converge the different priorities concerning spatial development.

The question nevertheless is to what extent and with what means the professional public can approach the general public - not only to represent the spatial issues but also to interpret it in a reflective and logical manner that arouses a deeper understanding. The current development of presentation techniques justifies the assertion that presentation techniques in spatial sciences are based on visualization. The progression in this regard involves deliberated and suitable visualization support which, as King [11] states, further provides a focus for a community discussion on spatial issues and guides all members of the process to enhanced communication.

However, visualization techniques vary from the very conceptual to the more concrete - easier to “grasp” forms. Bosselman [12] distinguishes between the two main principles regarding “the perception of the world”, which may be (applied to the image or message itself) abstract/conceptual or concrete. The concrete approach is directly derived from the experience, whereas the abstract approach is derived indirectly. Although the conceptual visual language is rational in terms of professional collaboration, we deem the experiential approach in visualization a crucial factor for the general public to comprehend the sensitivity, quality or weaknesses of urban space. In regard to the mentioned discrepancy and the different manners of visualizations that take place at any and every stage of the design process, Batty et al. [8] pragmatically distinguish between forward and backward visualization. Backward visualization involves developing visual tools and imagery which support expert and professional communication, while forward visualization supports a less informed and less skilled constituency, which is also a focus in this research.

2.1. Guided interpretation of urban space

To briefly return to our research attempts in the frames of this debate. Our efforts here in its widest sense are committed to understanding the cityscape- its societal, economic and environmental dimension by the
broader general public - with a great emphasis laid on the conveyance of interdisciplinary professional knowledge in a form that can enable deeper comprehension of urban structure and phenomena through the optics that reflect the everyday experiences with the urban spaces. As cities are formed by the diversity of factors with different influences [13], so are their smaller parts subjected to different impact forces that possibly regulate the character and quality of any particular urban entity.

For this reason we propose (Figure 1) an interpretative model (aMIQUS - A Model for Interpretation of Qualities in Urban Space) as a mechanism for identifying and tracing the vital spatial elements and arrangements that represent the essence of the theoretical, more abstractly defined metrics and also to explain their declarative importance by means of user needs and expectations at the everyday level.

The model consists of two main adequate parts: the first part is based on the generalization of spatial complexity into the key spatial elements which serves as input (factors such as climate, weather, season, day/night, peak-hours, impact of past development and development of wider spatial area are considered in the model within the category of “external factors”), and further their simplified but systematic linkage to both, abstractly defined qualities (professional aspect which serve as the argued leverage for explanation of impacts) and pragmatic vital qualities - additionally designated as vital qualities (VQ)1- serving at this point as the user aspect and the model output.

The second part of the model is a visual extension of those outputs, proposing visual presentation of the essential elements, by which the aggregated measures can capture visual expressions on the experiential level in the location that is at issue. Moreover, by visual presentations our major
attempt is to merge two principles: first, rousing one’s experiential spatial percipience that would then assist comprehending and decoding the visual message and further rule his decisions and attitude concerning urban spaces and second, to pledge a certain level of genericity in a visual design that has a potential for prompt and repeated application in different spatial circumstances.

The ultimate challenge here is to establish such model software support that can be navigated and managed by the general public (as an application user) with the mediatory role of professional public as the presenter of a certain message or urban story. It is therefore the effort to develop a model in terms of an integral, visually supported educational tool. And the question to be set further is - what is it that we, as expert public, want to emphasize when guiding the interpretation or “reading” the urban space to general public? Along with exposing how the different urban spaces affect the user’s experience, how it works, what it offers, how it is organised, how is it meant to be used and so forth, along with this, we endeavour to shed light upon the broader importance of beneficial urban design. Thus it serves to elucidate, how prudently considered arrangements of each geo-entity in the built environment can contribute to the essential dimensions of the development, such as social interaction, economic viability, and rational use of natural/cultural sources; and to justify the importance of each.

3. INITIAL PREMISE UNDERLYING THE MODEL

The conceptual dimension of the model is leaned upon the idea that comprehension of the urban realities by the general public differs remarkably from a professional comprehensions. To understand this distinction, the following principles that form the basis of the inner mechanism of the model should be highlighted.

3.1. Expert optics - reasoning and language

The metrics and language for communicating the spatial qualities in urban environments has been developed within different domains, mostly architectural design, urban planning, and, more recently, by scholars of cultural studies, and social geography. Also theories from environmental psychology, e.g. [14], urban social studies, e.g. [15] [16], and studies related to way finding, physical activity and health, e.g. [17] [18] [19] [20], use the existent, rather abstract and conceptual terminology, notions and manner to describe the characteristics of the built environment. The latter is a reasonable step in order to facilitate easier communication and transfer of the ideas which, for this very reason, are commonly subjected to aggregation and are represented visually at the more conceptual, less tangible level.

However, the latter proves to become a hindrance when introducing participatory approach into the research on spatial quality as well as when
empirical and traceable measures are needed. In addition, the preliminary problem also seems to become the multiplication of notions, their often indistinct meaning, vague interpretations and, especially, the inconsistency regarding the use and dissimilar taxonomies. Frumkin [17] claims that many recommendations for “good places” are available, but few are based on empirical evidence of measurable criteria, and thus are often incompatible with current research practice. Here, the abstract definitions of spatial quality and its argumentations seem to fail in providing the expert public with a solid tool to assess the urban space or else, even more important from the aspect of this research, in offering an applicable instrument for communicating it to the general public.

Therefore, the first step in the pursuit of our goals, regarding the knowledge conveyance was to set a reduced range of information and measures, addressing the quality of urban design. According to the review of the literature addressing the quality of urban design (investigating user responses to different spatial features or presenting guidelines for urban designers), an extensive list of the terms used was documented. Additionally, systematic clustering was made in regard to the similarity of meanings and further comments of the authors. The most overlapping or weakly definable expressions were eliminated and further regrouping was made to extract the most frequent and applicable terms that have emerged in professional language to express spatial qualities. As a result, the basic selection was formed to frame more recurrent and recognized merits for further work (balance, visual order, unity, identity, adaptability/flexibility, maintenance, diversity, functionality). They represent the starting point of relevance, a rough mark-off for discussing the issue of spatial quality within single and among different spatial disciplines, and in our case, most importantly, to further communicate it to the general public.

3.2. User optics - reasoning and attitude

By contrast, an average user of the urban space rarely or never wonders about the notions, such as enclosure, linkage, visual order, or unity that characterize a definite urban location and theoretically support the idea of quality urban design and development. Rather, one is concerned with the potential of this place to suit his needs and expectations on the level of his experiences with it. It is therefore also the spontaneous reaction of the user (in regard to the stimuli of given spatial features) to co-create the place with his behaviour and activities. Gehl [7] states that experiencing other people, interacting with them or merely observing them or being among them provides a particularly colourful and attractive opportunity for stimulation, gain of valuable information and pleasing sojourning in the urban space. The latter can considerably enrich the experience of a built environment and of the objects within [21]; however the supporting prerequisite through the prudent design is to be given first so that “life
between buildings’” occurs. This brings us back to the basic elements and features of this very space, designed with strong or weak potential to facilitate users’ needs.

As stressed above, users’ needs and responses to the given urban place are the users’ scale for its appraisal. And observing a particular place through the prism of the users’ common expectations seems to be a good starting point for understanding its complex nature and for further linking it to the condensed conceptual prospect. Observing through the prism of experience with the emphasized value for the user - we highlighted three qualities of vital importance (VQ) that well designed urban spaces should enable and stimulate: a) optimal and balanced physical access using different travel modes; b) comfortable movement through the space; and c) pleasing sojourn through the spatial functionality, its program, amenities and appeal.

3.3. Combining the different optics

The three selected vital qualities (VQ) represent a relevant concern from the professional point of view while signifying the place’s declarative worth, as well as corresponding to a kaleidoscopic insight into the spatial structure through the user experience. Spatial qualities defined in that manner are closer to general public comprehension and reflect tight linkage to the observable, by far measurable, spatial elements and features. On the other hand, a cursory glance at the VQ reveals their indisputable bond to the principles of professional measures at the same time (as formerly described). The question, nevertheless, is: to what extend can one (a user) associate own experience to professionally defined spatial qualities?

With the model proposed, we provoke the two different optics, and the corresponding vocabularies, attitudes and reasoning while addressing spatial qualities - albeit both deriving from the characteristics of the same fundamental and tangible spatial reality. In other words - plain spatial elements in this role have the potential to bring the distinguishing comprehensions of spatial quality to a common denominator. Combining these two aspects is the main idea and the mechanism underlying the model, allowing one to select and limit the amount of information to be interpreted.

4. URBAN REALITIES PACKED IN A MODEL - METHODS

There is a variety of things that are commonly referred to as models - whether geometrical, mathematical, conceptual or physical - which are always a substitute for a real system and we use them when it is easier to comprehend or work with a substitute than with the actual reality [22]. aMIQUS represents some aspect of a real urban system, simplifying and interpreting the relations between the observable set of elements (input
variables) in a specific micro-urban unit and the three VQ regarding its use-access, passing/movement and sojourning (output parameters). Each input element (or a composition of elements) and its characteristics hide the leverage behind that clarifies its positive or negative contribution to the three of the output qualities - articulated as a numerical degree which further convey the visual language embedded into the visual depiction of the space unit. The model is developed on the basis of the city of Ljubljana, and then modified and “softened” in a way to fit the basic settings in medium sized European cities. Cities that are structurally more distinct or larger would claim greater modifications of variables.

To establish the inner mechanism of a model, different research techniques were applied, which can be divided into three work phases described further in the text. Following the developmental phases, described earlier, led us closer to the anticipated outcome which is a model used as a digital educational tool.

4.1. Phase one - defining the variables

Initially two fundamental segments were prepared in regard to defining the input and output variables. The vital qualities (VQ), formerly described as output parameters, were first determined in a way to enable acquiring the influencing factors (i.e. the input independent variables).

We thoroughly defined the crucial forces by which a single VQ is modified. We demonstrate hereon the case of accessibility (one of the three VQ). It is conventionally defined by overcoming the spatial resistance in time and space [23]. In most fundamental terms this implies certain intake of time and energy - perceived either as physical or financial stake - as well as the continuation of suitable traffic infrastructure. While such demarcation might be applicable in large-scale spaces with lump-flat estimations of travel accessibility, it has limited importance in observed mid- and small-scale spaces. Tackling urban spaces through experiential perspective additional factors gain relevance in regard to accessibility assessment. Thus, four accompanying decisive factors (along with the time and energy consumption) that significantly affect the level of accessibility were added: a) infrastructure support b) traffic regime - by modes c) level of comfort within the single travel mode and d) level of traffic safety - by modes. The latter two are reflected in the users’ sense of safety and comfort that consequently influence/regulate the users’ choice of route and travel mode (Figure 2).

Similarly as demonstrated by accessibility, decisive factors for the other two VQ were searched for. The selected output parameter of “passing through/movement” follows roughly the same forces as in the case of accessibility. However, it pertains exclusively to the characteristics within the selected location, excluding the spatial context which is more crucial for accessibility. The factors that influence the intensity of users’ sojourning in a
particular urban space seem to be more structured. We define it throughout the activities facilitation, functionality (apart from movement which is being dealt with separately), appeal, level of interest etc. While in some cases, the relevant forces that drive the intensity of sojourning and human behaviour are highly evident and can be quantifiably measured, in many other situations they can’t be detected or quantified as easily. In these situations, we had to rely on the scarce existent theories derived from the behavioural studies.

To strengthen and to verify the significance of decisive factors and existent statements, a short inquiry was conducted among the selected experts (from the domains of architecture, planning, sociology, geography and landscape architecture). The study addressed the problematic spatial relations to acquire more information about the inadequately covered topics. The Delphi method, in two rounds, was applied and the responses of 11 experts were examined. The inquiry also covered certain unknowns regarding the input variables, their significance and impact rate. Detailed analyses are accessible in [27].

Once we explicitly defined the output parameters (accessibility, passing/movement, sojourning), namely the optics through which the urban spaces would be looked at, the next phase consisted of an attempt to capture the highly nuanced characteristics of the certain urban place as the input entities, and to determine their impact on the output parameters within the same place. We attained that first by breaking down the visible spatial reality into its basic shapes and elements that hide beyond a wider notions of: natural elements (tree, river bank, green plot, flower decoration etc.), urban furniture (bench, trash, bike rack etc.), program (daily services, shops, snack&drink facilities, urban art performance, street vendors, market stall), traffic infrastructure (cycling path, roadway, street crossing, traffic lights, sidewalk, etc.), elements of cultural, historical and symbolic artefacts (monuments, art installations, architectural heritage etc.), basic geometry of
the space, transition between indoors and outdoors (restaurant terrace, shop-window, balcony) etc. Moreover, relevant agents of the spatial context (not tangibly manifested in the selected locations) were added according to their presumed influence upon the vital qualities within the location. Altogether 167 potential input variables were set at the initial phase. Each was then set up as an entity, capturing a finite number of possible states in terms of their quantitative or qualitative attributes.

4.2. Phase two - assigning the impact rate to variables

The central part of the model systematically links the input elements (input variables) and the tree VQ (output parameters). Two of the VQ are being observed from the perspective of four different travel modes. For this reason a synoptic scheme in multiple layers was generated (Figure 3) and embedded in the model. It first defines the input variables and describes the semantics, taxonomy and relationships among the entities proposed.

The layered diagram made it possible to employ simple mathematical statements, i.e. work with mathematical groups (associativity, closure, intersection, union etc.) and logical statements, where each statement was assigned a relevant additional weight (using MS Excel, see Figure 4). After the selection of the basic elements that possibly form the representation of an urban scene (according to the knowledge resources²), comes the important
moment of elimination of all the elements whose minor contribution/impact will be neglected, with the purpose of avoiding the clutter, misunderstandings, distractions - in short: to avoid the noise. As a result, a numerical output is reached for each VQ in accordance to the elements’ presence/absence in the place (assigned states: 1,0) and their significant characteristics (discrete intervals), as well as in regard to the contextual spatial circumstances.

As a result, a numerical output is reached for each VQ in accordance to the elements’ presence/absence in the place (assigned states: 1,0) and their characteristics (discrete intervals), as well as in regard to the contextual spatial circumstances. This structure enables that each element traceably indicates the impact on each VQ of the place given. The output value was then further linked to the pre-defined degree scale by which the abstract measure of, for instance, accessibility was relativized and adjusted to settings within Ljubljana.

To demonstrate this series of assertions even more evidently, the principles of parametric modelling (Grasshopper) were employed, however, experiential visualization was not adopted at this stage. The number sliders were used to define the value (numerical or descriptive) of each input variable within a certain range and type, and simple mathematical functions were employed, as in Excel, to define its numerical contribution to the
output value of each VQ. Since parametric design enables to selectively track and recall the value of any parameter it was possible to link the compounded final measure of each VQ by its input contributors and their share. This is especially important for further phase which proposes the experiential visualization of the input and output variables/parameters.

4.3. Phase three - transferring the numerical outputs to experiential visualisation

The subsequent part of the model was developed as a visual extension of the outputs, proposing a visual presentation of the interpreted patterns within the space/location that is at issue. A methodical approach was adopted on the basis of the existing knowledge and pre-conducted empirical study to present the model outputs in a comparable, systematic and generic way, where decisive factors, such as graphic mode, perspective manner, scale, level of abstractness, complexity, level of detail, intuitiveness, are taken into account. Although contemporary digital tools allow us to accurately capture the 3D reality with textures, colours and other elements, and although the public have been primed to expect immersive, interactive and dynamic applications, it is not always the proximity (by which a certain visualisation is drawn to actual reality), that determine the effect of the message hidden beyond the tangible elements depicted. Moreover, the effect of the message and the accuracy of conveyance we claim depend significantly on the rudiments of suitable techniques regarding information depiction, and not necessarily related to the use of highly realistic, immersive or interactive environments. As mentioned earlier, the crucial split refers to the predominantly experiential or primarily conceptual aspect in information representation, which further crucially determine the opportunities for summarizing, condensing and generalizing the information and characteristics of the urban realities. We were forced to resort, at least in part, to the use of more concise forms of visual communication, allowing us quick and precise exchange of ideas, inquiry about quantity, meaning, relationships and connections relating to the content.

A prototypical mechanism was developed (Figure 5) with the Adobe Director to link the numerical model to the external visual extension. The basic idea of the proposed application represents the principle of recording the spatial elements input and their attributes by means of the digital library of pre-selected photographs of urban units and a digital library of optional spatial elements. Each element selected and placed within the frame of the background layer (performed by the application user) then affects the three output values (defined by the numerical part of the model) and generates visual representation in terms of the qualitative and quantitative trait.
5. MODEL AS AN INTEGRAL EDUCATIONAL TOOL

Upgrading the visualization power of the model raises additional considerations: A) a simple digital interface to import the spatial data and to outline the characteristics of the selected urban unit; B) a software-based visualization extension of the model, with corresponding visual forms assigned to the numerical outputs and; C) an algorithm-based engine to place the visual forms in the pre-selected and reconstructed urban unit.

The greatest challenge - addressing each of the above mentioned structures - was to establish such software support that can be navigated and managed by the general public (as an application user), that facilitates quick and intuitive entry of the spatial data and follows the sufficient accuracy in reconstructing the geo-unit, its elements and phenomena, while maintaining adequately generalized algorithmic structure to pledge a certain level of uniformity that enable comparison and recurrent relevance in different spatial circumstances.

In the current state of research three separate mock-up solutions were proposed (Flip, Vili and Balthazar). While Flip (see Figure 5) and Vili represent the two complementary but separate digital phases of importing data by means of photography and manipulating visual objects, Balthazar puts forward their integration and further pursues the characteristics of integral educational tool for interpreting the urban spaces. The figure below (Figure 6) outlines the main phases as they follow the preparation and manipulation of the visual materials by the app user and further shows the reconstruction and generation of the place with its qualities within the experiential frames.

In the first phase identification of the basic spatial structure of the selected urban unit is addressed. It allows the positioning of the built
objects within the layout of selected spatial unit, defining approximate height (e.g. by defining the floors) of the objects and marking off the rough outline of the area on the grid with the corresponding coordinates. The second phase addresses the identification of functional or other areas (traffic road, bus lane, cycling path, sidewalk, lawn, restaurant terrace, etc.) and the input of additional elements (urban furniture, greenery, monuments, etc.) from predetermined set of available elements/features, located in the corresponding library file. A set of rules and conflicts, among the elements, should previously be defined to avoid placing them unfeasibly suited (to real-world circumstances). Only a limited set of possible combinations between the elements can be accomplished. In regard to the features defined, the third digital phase provides an estimation of the output values and the corresponding visual forms. This action follows the algorithms underlying the model (aMIQUUS) principals and therefore represents the essential part of the application, being followed by a visual representation in the last phase. Finally, the last digital phase promotes the experiential visualisation of the
site. User is allowed to arbitrarily determine one or more standpoints within the reconstructed plot (conceptual level). The selected points are the basis for a visual presentation in a pedestrian perspective by means of 2D or 3D computer graphics. In addition, the final visual presentation comprises both the arrangements of the input elements and the arrangements generated consequently - by means of the generated outputs. Later on, the modifications of the input attributes are enabled and accompanied concurrently by the emerging changes in the experiential view (pedestrian perspective). In this way any adjustment made in respect to the attributes of the input variables is expressed in the final presentation at the experiential level, which ultimately demonstrates the cause-effect narrative and therefore provides an interpretation of the relations.

6. FURTHER REMARKS

Since this paper focuses on the model mechanism structure in a greater extent than the application dimension, we owe some additional remarks. First, in geospatial terms aMIQUS is valid within the frames of Slovenian urban context, more accurately - it is intended for interpretation of public spaces comparable to the environments of Ljubljana (cultural-, geographical-, socio-economic dimensions), although the fundamental structure conforms to a universal form adjustable to a wider palette of urban environments. Scale of space units limited with respect to the model input segment that requires rationally defined mid-scale geo-entities - bounded either by visible geomorphologic, building or infrastructural edge or merely by the user’s visual embrace (e.g. square, part of the street, river bank area or other spatial segment within visible reach of the pedestrian). There is a rational reason for such vague spatial mark off - it is followed by the major idea of the model, proposing simplified recognition and recording of the input elements as well as straightforwardness in limiting the investigated area. The model is therefore adjusted in a way to correspond to diverse, rather arbitrarily chosen geo-units that appear to be at issue. Moreover, the inputs’ characteristics that capture a certain value, when a spatial entity is being applied, are set up as ordinal variables. This enables prompt and intuitive input of initial data on the basis of visual appearance of the actual place. It is beyond any doubt that a footpath, a low wall, arcades, a restaurant terrace, or a bus stop can, in fact, capture numerous different configurations and nuances; however, essential for the model is such reduction of the elements’ accuracy that they are applicable to a high proportion of urban spaces in Ljubljana on one hand, and yet reflect the significant differences in affecting the VQ on the other. Methodologically, each spatial characteristic has to be systematically varied independent from other factors, and, analytically, a measurable spatial form has to be described in few generically applicable meaningful dimensions.
Second, establishment of a series of assertions that regulate the model stone is being derived from a diverse set of data, information and knowledge, of which some are to a lesser or greater extent quantifiably explicit, computationally compatible, convenient for model processing or adjusted to mid-scale spaces. Although it seems the research methods in contemporary spatial disciplines incline towards highly comparable and explicit measuring, certain hindrances appear and manifest particularly when dealing with exceedingly complex and multifaceted cause-effect relationships among the spatial and social features, where the methodologies, techniques, output formats, optics and initial goals of separate investigations are extremely diverse, and often poorly comparable. Thus, joining the heterogeneity of knowledge in one system was a great challenge and obliged us to form a flexible model structure, compliant enough to enable convergence of explicit and implicit assumptions regarding the impact of urban characteristics on perceived quality or use.

7. CONCLUSION

Suggested by our on-going research, the interpretation of the urban spaces and the information they provide, was taken on the basis and by means of experience-based visual approach. Given the abundant, complex conglomerate of an urban scene, the continuing interest is, what urban elements and features we are actually able to discern, track and perceive. And further, what urban elements, represented by what visual means are useful when transmitting meaning to non-experts, less skilled in visual analyses and more prone to intuitive reading of space and its visual presentation.

The efforts of the model aMIQUS are threefold: first, to form common, valid, applicable and convincing measures to assess valuable features of space design, second, to indicate the developmental trait that considerably affect user’s spatial experience which - taken as a consequence - derives from either sustainable/prudent or poor design decisions; and third, to generically recreate and visually represent urban spaces for research and for communicative purposes. The model therefore represents an identification method, not a problem-solving mechanism. It is an instrument for decoding professional language and reasoning in terms of the sustainable urban design, and furthermore a method for identifying/tracing the contributors that generate the existing circumstances in a certain urban space. The idea of the vital qualities (VQ) - as derived from the pragmatic potential of a certain location - demonstrate the intricacy of all fundamental elements and processes within the frames of physical, societal and economic realities. It is therefore a remarkable challenge to assess and present them as an intelligible and logical whole as well as to associate them with beneficial design principles. Unsurprisingly, not all public spaces have the same predispositions to support the mentioned dimensions of development, nor
are they equal in regard to their experiential potential - not all have the privilege to be located along the river, to be placed centrally or to enjoy the status of cultural heritage etc. Moreover, the level of delicacy and the tolerance for human interventions vary enormously among the different urban spaces, although the user is not necessarily aware of their structure and eventual fragility.

Thus, our efforts promote the potential for highlighting the frame of manoeuvrable room in urban design, giving consideration both to users’ demands/needs as well as to sensitivity and responsiveness of the mere spatial reality, which in turn influences the users’ behaviour as well as reveal the spatial thresholds in terms of social, economic and environmental constraints. The motivation is to expand this research scope not only in regard to the technical or applicative aspect, but also in the aspects of the underlying empirical, theoretical and methodological contribution to the common understanding of the urban scene.

REFERENCES


**Endnotes**

1 In a model we selected and highlighted three definitions of space use - additionally designated as vital qualities (VQ) - that contribute significantly to the experiential/perceptual value of urban space, i.e. ease of access, ease of movement and stimulated sojourning of the users caused by the space functionality, amenities and appeal.

2 Generalizations and pondering are based on the data/knowledge deriving from a statistic database (Statistical Office of the Republic of Slovenia) and
interdisciplinary studies dealing with Slovenian cities, e.g. [24] [25] [26]. However, fundamental/theoretical input from relevant fields is applied by means of a wider literature, not necessarily related to the Slovenian environments.

3 The contribution of the empirical study regarding presentation techniques implies relevant and applicable results, which being elaborated individually in PhD thesis [27].

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