Non-conventional Representation for Urban Design: Depicting the Intangible

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Abstract. The contribution presents an educational approach of representation and simulation for higher education of architecture and planning. The focus is on the representation of the quality of the intangible urban issues related to the experience of places, that is multisensory perception. Since the topic is not defined by coded approaches, as happens for instance with geometrical drawing, the authors proceeded with a trial and error process, that is an experimental procedure that involved Master of Science students. The paper presents the topic and briefly compare conventional and non-conventional representation, and presents the experience gained in architectural higher education by showing and commenting some outcomes of the course "Architectural and Urban Simulation" at Politecnico di Milano. The educational process aims at merging sensory urban design approach to the representation of the intangible elements of the urban environment, by conceiving representation as a crucial element for well focusing the subject, from the urban analysis to the final output, i.e. the design project.

Keywords: Non-conventional representation · Urban simulation
Multisensory urban design · Higher education

1 Introduction

The contribution presents an educational approach of representation and simulation for higher education of architecture and planning. The focus is on the representation of the quality of the intangible urban issues related to the experience of places, that is multisensory perception. Since the topic is not defined by coded approaches, as happens for instance with geometrical drawing, the authors proceeded with a trial and error process, that is an experimental procedure that involved Master of Science (M.Sc.) students. The work is being developed in the "Architectural and Urban Simulation" course, taught by the authors, at Politecnico di Milano since 2011 and based on several case study applications. The kinds of products developed along the years include sketches, noted photographs, photo-montages and collages, diagrams and schemes, textual descriptions, videos, renders, views from online maps tools, and similar.

The seven years of experience on the subject with students of the last two years of the M.Sc. in Architecture and Planning, highlighted that they have some difficulties in focusing the topic, since they are generally trained to use traditional and conventional tools for each step of the design process; hence, asking them to focus on the intangible aspects of the urban environment, to analyze and to communicate these issues using tools and methods that are not conventionally coded require a specific process of learning based on lectures and practical exercises. These exercises and the weekly reviews with the professors are crucial for the "learning by doing" approach.

2   Conventional and Non-conventional Representation

Today the ability of representing and communicating architectural solutions, urban design projects or urban planning strategies and plans is turning out to be crucial not only for professionals belonging to these fields, but also to all the actors involved in the urban transformation processes. Indeed, there is an increasing need of making contents and proposals more explicit for a growing number of inhabitants that ask to be involved in public decisions; therefore, the topic is gaining importance not only for scholars and professionals, already trained to read maps and plans, but also for lay people less acquainted to interpret technical drawings. Certainly, such ability requires a specific competence for envisioning urban conditions, such as sound and temperature, and in general the sensory dimensions, that are traditionally non explicit in the graphical representations. It is also important to note that nowadays the massive usage of realistic renders might seem to be one solution for better disclosing urban transformations to a non expert public; as several authors argument (see for instance Appleyard 1977; Bosselmann 1998; Sheppard 1989, 2005; Piga and Morello 2015), this modality can easily lead to unreliable messages and therefore biased interpretations, and the topic required a serious critical approach, that of course cannot be discussed here; nevertheless, even this types of simulations are not fully able to portray the invisible elements of the environment. Non-conventional modalities seem instead to be an effective approach for filling this gap and for supporting the illustration of intangible urban elements from a qualitative perspective. This is relevant not only for communicating to lay public, but also for reinforcing the competences of younger professionals, i.e. architectural and planning students. To achieve this goal and to integrate the students' representational toolkit, it is relevant to provide them a wide range of graphic skills and to enable them to gain an experience that can critically drive the choice of the proper tool to use for a specific purpose; the updated toolkit should of course include both conventional and non-conventional modalities of representation and simulation.

Coded representation exists since plenty of time. For exploring a large scale context, the map has been assumed as the key representation medium since it is gives back an "objective" description of reality (Farinelli 2009). Indeed, as it is well known, maps are based on a view from above able to describe, in scale, the perimeter of buildings, streets, etc.; in other words, the map provides the layout of cities based on their real proportions and depicts the geometry of natural and artificial objects. Even if this is only a simplified description of what a map is, and it does not take into account, for instance, the topographical or aerial procedures needed to get the result, the output, i.e. the map itself, presents above all quantitative information regarding shapes, formal relationships between urban elements, proportions between open and built spaces, streets network geometry and so on. Similar characteristics are related to sections and other profiles, such as skylines, that can be drawn starting from the map itself. Some numerical information, such as terrain or building heights, can be embedded in maps, plans and sections, although in all the cases these are bidimensional representations based on horizontal and vertical planes related to elementary geometry. Reducing the scale, i.e. considering the buildings' one, the situation is similar to the previous one: indeed, for describing the built space we employ abstract forms of representation derived from the field of Descriptive Geometry, basically plans and sections, namely bidimensional and scaled drawings or axonometry.

These coded forms of representation are fundamental, but beyond geometrical/metrical descriptions of buildings and urban areas, the depiction of other features that are not immediately evident by the shape of cities requires different non-conventional approaches, especially when the goal is to grasp their qualitative features beyond the quantitative ones. For non-conventional representation we refer to all the ways in which the environment can be depicted in order to communicate its specific characteristics beyond its purely geometrical configuration. We primarily refer to all the ways in which it is possible to depict the perceptive and sensory dimension that are impalpable by nature and that contribute to shape the urban experience. Hence, the challenge is to catch and communicate the intangible elements of cities such as sound, smell, comfort of urban spaces, personal impressions of the environment, and so on; but how to represent all these features? This is not an easy task, and it is probably not beneficial to answer with another coded approach, rather it seems more efficient to find different ways of representation according to the specific communicative goal and peculiar context (see for example Grubbs 2008). Of course, is it not an ambition of the paper to give an answer to this interesting challenge, rather the contributions aim at stimulating a debate on the topic starting with the experience developed with Master of Science students of architecture and planning.

3 The Application in Higher Architectural and Planning Education

The course "Architectural and Urban Simulation" aims at representing urban places and the relationships between people and the environment as the starting point for developing urban design solutions; following the approach outlined by key thinkers on cities, such as Lynch (1960), Bosselmann (1998, 2008), and Gehl (2011, 2013), the

course considers the human senses as crucial; it is particularly focused on the sense of sight, touch, hearing, and to a little extend also to smell. As a consequence, the multisensory perception of places requires an attention to be depicted that should be equal to the one devoted to the tangible city.

The main goal of the educational approach is to train students to better focus the potentiality of different representational tools in describing the urban environment; more in detail, some educational goals, that inform the process, can be listed as follow: (i) to stress the importance of representing the invisible urban elements for design, (ii) to well focus the message to deliver, crucial step for a clear and effective communication (iii) to understand the different media potentialities, a necessary competence for choosing the right tool/s to use, (iv) to represent the contents in an efficient way, in order to delivered the desired message in a professional way. Therefore, the course deals with different kinds of representation and simulation techniques for supporting the development of urban design projects and for communicating design outcomes (Piga and Salerno 2017).

The teaching method is based on the "learning by doing" approach (Schön 1987) and is structured in recursive key-actions related to the different design phases (see Piga 2017). Operationally, this structure is reflected in a series of connected exercise that students, organized in groups, have to develop along the course. Every group has to find its way of interpreting the today condition of the case study application and accordingly the design project to develop, hence, the kind of elements to represent and the final outcomes differ a lot from group to group, even on the same case study area. By reviewing the results—not always satisfactory—collected along the years it is clear that the types of products can be organized in different types. These diverge not only in relation to the subject of investigation, e.g. soundscape, thermalscape and so on, but also in relation to the phase of the urban design process, to the technical ability and sensitivity of the students composing the group, and of course to professors' advisors provided along the educational path.

4   Reflections on the Representation Outcomes

As reported in the introduction of the paper, the kind of products produced along the years include sketches, noted photographs, photo-montages and collages, diagrams and schemes, textual descriptions, videos, renders, views from online mapping tools, and similar. Despite the years of experiences on the topic within educational paths and the number of representations produced by students, so far, it seems not possible to find general rules that can guide an effective approach to the topic or to define a specific and exhaustive method; rather it seems more fruitful to present and share some comment on the outcomes, hoping that this can reinforce a stronger focus on the theme of representation of the sensory intangible urban elements.

By comparing the students' representations (some examples in the figures below), is quite evident that approaches that privilege a unique representational manner (Fig. 1), are useful for posing the attention to one single urban feature, while combined solutions, that is representations that mixed different depiction methods, are generally more effective in describing the complexity of the urban context (Figs. 2 and 3); this is probably due to one main reason: the use of different modalities enable to merge together the communicative potentiality of each media. It is also relevant to highlight that the communication of the sensory dimension is generally described by students in a series of different but connected representations, sometimes of disparate kinds, such as colorful sketches or post-processed photographs linked to audio recordings, that are of course difficult to present here in a textual\images essay, such as this paper. More often, however, students tend to use images for describing their sensory experience; this is of course due to the fact that they are generally more confident to use visual representation due to their course of study. Definitely, the visual language can properly describe shapes and geometries, but is not totally efficient and satisfactory when it has to communicate other intangible elements, that are not visual by definition, such as sound or odors; this is in any case possible and already happen, with music for instance, but reading this abstract representation for virtually hearing the music in our heads implies, again, a technical ability for interpreting a code, that moreover belongs to non architectural fields. Hence, to depict the multisensory reality and to communicate it in a non coded way the easiest way seems to be referring to modalities that are more near to the type of sensory stimuli. This is possible with sound, where audio tracks for instance can be easily registered, but is of course more difficult with other senses. Without a proper ability to use other forms than the visual language, often students tried to overcome this limitations by creatively using the graphic representation. Even if not all the results are completely satisfying, also due to the fact that is generally the first time they have to face this kind of approach, the process seems to be relevant for them and moreover has had an impact on the way sketch out the design project, i.e. careful to sensory aspects. Hence, even if the outcomes do not always enable to deliver the desired message, the process activate anyhow a learning process. In general terms, mixed solutions made of illustrations augmented with text are generally effective, and allow to reduce the risk of a mislead interpretation, that can happen especially when using non coded and unexplored approaches. This kind of communication is particularly useful for describing concepts, such as strategic guidelines. For illustrating design concepts, the use of combined pictogramas, designed ad hoc, with textual description have generally resulted very effective (Fig. 4). To communicate the today experience comparing a photograph of the urban environment with its interpretation, for instance through drawings or photomontages based on the same frame, support the disclosing of the authorial interpretation is also an effective way for pushing the audience to discover the architect's idea and to get the general feeling filtered by her \him (Figs. 5 and 6); in this case, however, the representation ability is relevant to produce significative and effective outcomes. Anyhow, comparing the same area under
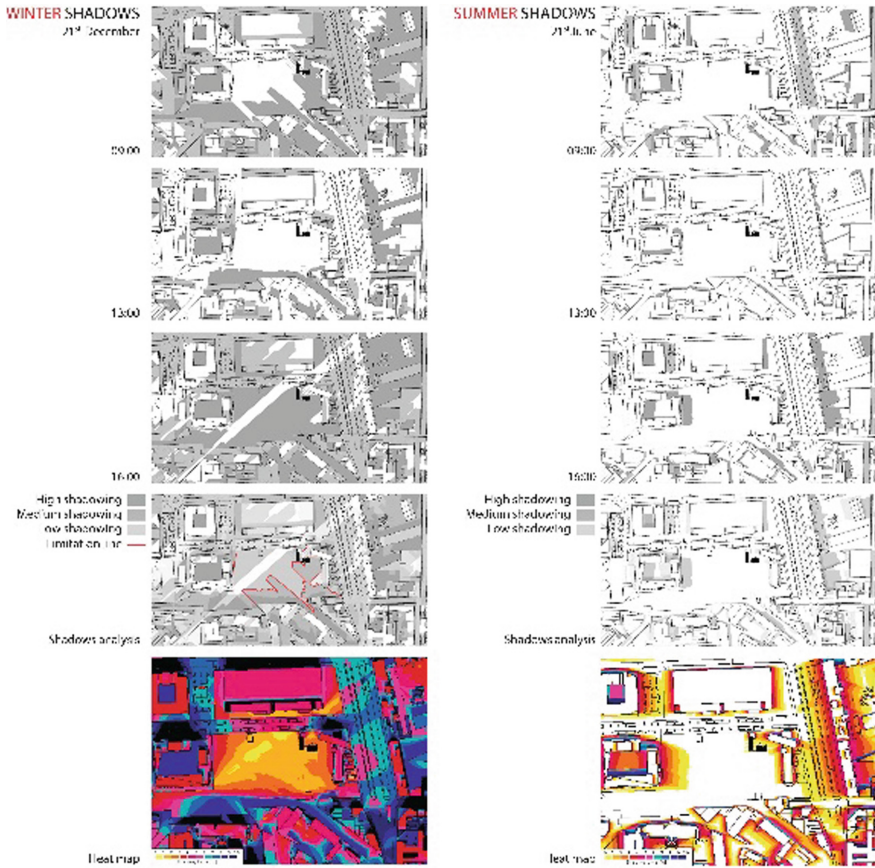
Fig. 1. Sample of representation using a single depiction modality, in this case a shadow casting analysis. The black and white images depict winter (left side) and summer (right side) shadow casting in different hours, while the colored images refer to an automatic computation of the coldest and hottest areas in the two seals. The images were developed by students of the "Architectural and Urban Simulation" course on the case study of the Smart City Lab (left side) area in Milan. *Credits* T. Courcier, R. Di Benedetto, K. Jankowska, B. Cantin Jorge, M. Dalila Pandiscia, M. Vera Saez, S. Zanetti

different conditions is often an effective method to focus the attention over changes, for instance before\after construction (Fig. 7), or over time, for instance along the seasons (Fig. 8). Clearly, the same communicative goals can be reached using other modalities of representations, that, together with these ones, can contribute to delineate a useful atlas of results.
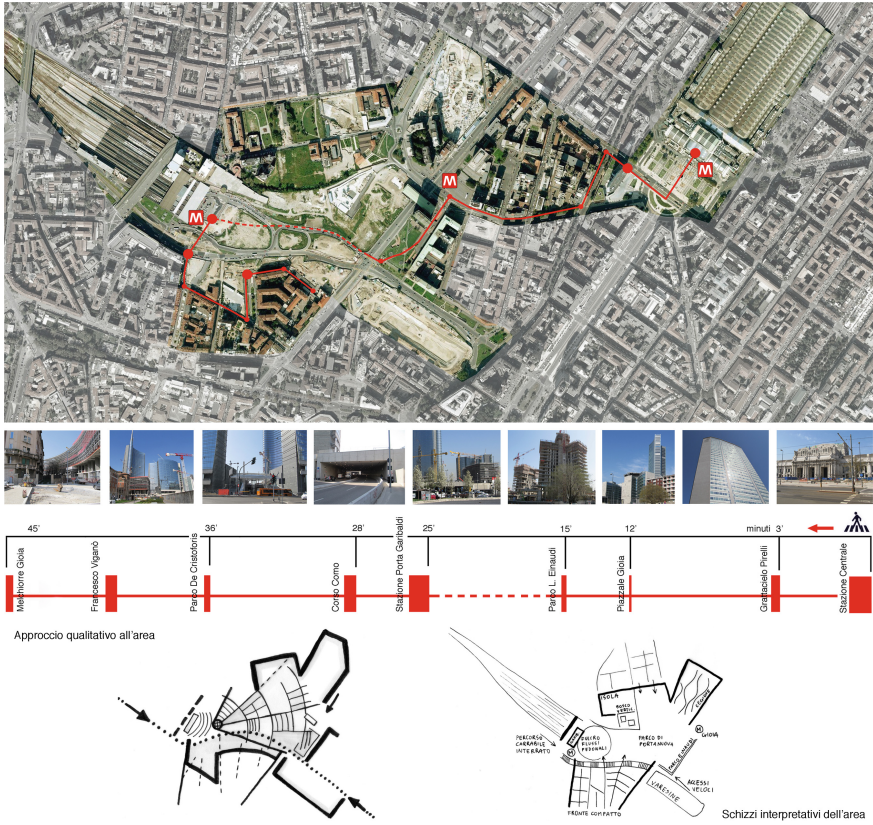
Fig. 2. Sample of representations that combined different depiction modalities. The upper image represents a walk from Stazione Centrale to the Garibaldi-Repubblica area in Milan; on the map it is possible to see the entire path and its relationship with the layout of the city seen from above; the images below portray relevant urban elements met by the walker, below the time of the walk. The sketches are two interpretative schemes of the area. The study was developed by a student of the "Architectural and Urban Simulation course" on the case study of the Garibaldi-Repubblica area in Milan. *Credits* M. Scolari

To conclude, it is important to reflect on some problems encountered for benefit future applications of the approach. It is possible to summarize four main criticality expressed by students (i) the difficulty to understand the task of analyzing and representing the invisible urban elements, (ii) to well focus the message to deliver, since they are generally not trained to think in this sensory direction (iii) to understand the media potentialities and choose the right tools to use for this untraditional request, (iv) to
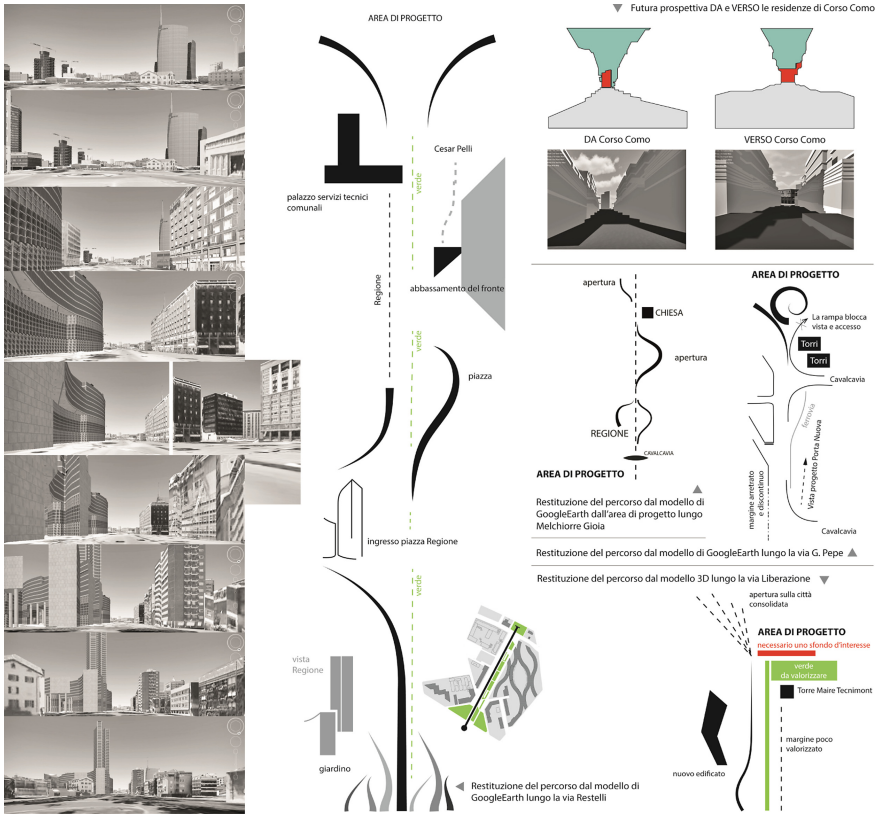
Fig. 3. Sample of representations that combined different depiction modalities. The left images represent a sequence of subjective images of a walk in the Garibaldi-Repubblica area in Milan; the right side of the images present some schematic interpretation of the perception of the same path. The study was developed by a student of the "Architectural and Urban Simulation" course on the case study of the Garibaldi-Repubblica area in Milan. *Credits* R. Magri

represent the contents in an efficient way, moreover on a topic that is still non-conventionally coded. On the professors' side, it is possible to highlight two main issues: (i) the initial resistance of students to enter a new approach, (ii) as a consequence, the importance of establishing a relationship based on confidence and trust between students and professors, that seems to be more relevant than in other more traditional courses. The resistance of students might also be linked to the fact that they were following the last course of university, and they then expect to be already educated on the field; discovering that a professor is asking them a things that they

▲ 12 quality criterias for a good place; taken from Jan Gehls book 'Cities for People' (2010).   ▲ Jan Gehl

Fig. 4. The scheme represents the people-oriented key-concepts that the design project should take into consideration. The image was developed by students of the "Architectural and Urban Simulation" course on the case study of the Trifoglio (PoliMi) area in Milan. *Credits* A. Öhgren, D. Largo, J. Frisk, L. Garcia-Frontini, V. Petri.

struggling to have a clear focus might put them in an uncomfortable condition; if this is true, this means that they have to do a step back in order to do a step forward, or in other words, they have to discard for a while what they have learned so far in order to give space to a new modality to go forward. Anyhow, the difficulties encountered by students dependent on their previous experiences. Of course the entire process requires a mental shift, especially for students trained in a Polytechnique, that is an institute naturally grounded in the technical approach.

Fig. 5. Comparison between a black and white image of via Celoria in Milan (left side) and the interpretation of the road by a student. The image was developed by students of the "Architectural and Urban Simulation". *Credits* P. Chaiwattana
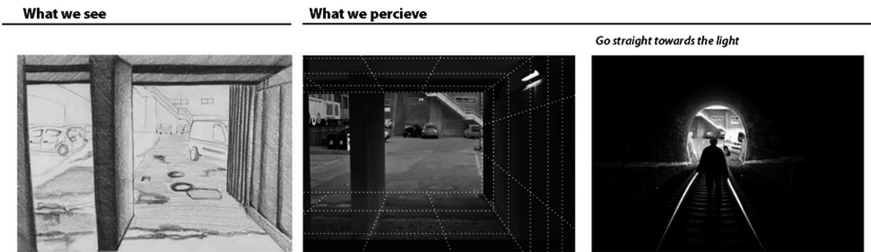

Fig. 6. The image shows the authors interpretation of a tunnel within PoliMi university in Milan; the image on the left is a post-processed photo of the existing condition, the center image emphasizes its geometrical configuration thank to a grid superimposed to b\w photo, while the photomontage on the right side present the authors' impression of the area. The image was developed by students of the "Architectural and Urban Simulation" course on the case study of the Trifoglio (PoliMi) area in Milan. *Credits* C. Chiarini, J. Cobo, A. Garello, A. Gonzàles, F. Zambrano, I. Vegetti.

Fig. 7. Comparison of the existing condition (panoramic photograph above) and interpretation of its potentialities in terms of activities and generated mood (photomontage on the bottom). The image was developed by students of the "Architectural and Urban Simulation" course on the case study of the Trifoglio (PoliMi) area in Milan. *Credits* P. Algarra, J. Berg, M. Calati, N. Gustafsson, A. Paniagua, G. Sahuquillo, F. Svensson.

Spring   Summer   Fall   Winter

Fig. 8. Series of renderings comparing the same point of view in different seasons of the area designed by students for the Trifoglio area at Politecnico di Milano; the image was developed by students of the "Architectural and Urban Simulation" course on the case study of the Trifoglio (PoliMi) area in Milan. *Credits* F. Ferrari; H. Hsine; H. Yiyi; L. Xiaoyue; S. Yu; W. Lingxiao; Z. Qichao.

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