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EXPLORING INVISIBILITY THROUGH MULTISENSORY SPATIAL RESEARCH METHODS

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Abstract

In this paper we present research methods usable in the absence of sight with the objective of exploring techniques that can allow spatial knowledge beyond vision. There is a visual dominance in contemporary built spaces neglecting invisibility, i.e. the multisensory integration of non-visual modalities. An example of this ocularcentrism can be found in the visible/invisible duality. Visibility is often thought of as a quality of the visible whereas invisibility is often neglected. By contrast we propose to re-think invisibility as a quality, arguing that its multi-sensory integration is of main importance given that visibility is temporary, which contrasts with the persistence of invisibility in human perception. Therefore, we explore invisibility based on qualitative research methods, developed by the first author in the condition of full blindness. We identified two useful tools to explore the space of invisibility: the use of interlocking building blocks in user-centred design discussion groups, and the use of elicitation models in post-walkthrough interviews. In spatial qualitative research, user-centred design can be interesting for the researcher's self-observation during the design process, exploring pertinent questions and feedback from diverse research participants. Therefore an important inclusive tool/material can be the interlocking building blocks system of Lego, allowing through their modularity and adaptability to build and rebuild models during creative discussions. In order to increase usability we present a prototype of an interlocking building block system with three main advantages: compatibility with conventional architectural scales, increased haptic comfort in a fast and continuous task of recognisability by blind people, and the absence of logos providing a material/tool with neutrality without imposing commercial references. Walkthrough interviews are important to obtain a holistic understanding of the interaction between the interviewee and the space being used. However, often researchers find problems with spatial restrictions to develop an audio or visual recorded interview. In order to avoid these difficulties we developed a post-walkthrough interview, consisting of a spatial experience with participants without recordings, just listening to their comments and observing how they interact with the space, followed afterwards by a video recorded interview in a different space using elicitation models. The presented qualitative research methods and tools can be useful to researchers in the conditions of blindness and low vision. Moreover they can be used by fully sighted researchers to explore multi-sensory research methods as deeper qualitative approaches to the space of invisibility.

Keywords: invisibility, multi-sensory architecture, physical models, user-centred design, walkthrough interview.

1 INTRODUCTION

Visual sources, mainly drawings and photographs, are currently widely used by architects and researchers, as important representations of spatial knowledge. Anthropologist Tim Ingold [1] questions the visual dominance over other sensory modalities as a source of human knowledge present in our ocularcentric culture. Some architects have taken notice of this ocularcentrism. Pallasmaa [2] states the need to survey critically the role of vision as a concern for architecture. Moreover, Vermeersch [3] states the importance of the role of representational artefacts in architects' spatial perception. We argue that architects and researchers often forget the multi-sensory potential of using physical models instead of visual representations. When architects and researchers use sketches they ignore the potential of the spatial reality provided by physical models testing their ideas. The empirical knowledge of Alberti [4] that physical models can identify errors that drawings cannot, seems to have been forgotten.

When architectural researchers introduce pictures to elicitate spatial memories from interviewees, they are not considering the potential of using physical models, which are less selective and limiting than photography can be. Moreover, unlike drawings and pictures, physical models allow to include a great part of the population, namely blind and partially sighted people who can be important contributors for the built space quality.

This paper aims to explore research methods and tools that integrate the quality of invisibility, specifically the multi-sensory integration of other modalities beyond vision, in order to balance the presence of ocularcentrism. However, we need to consider that visual representations have also important intrinsic qualities that cannot be achieved through other sensory modalities. For example, to complement the text of this paper we present some pictures, but they are secondary representations, they are not essential in the narrative, so they are not exclusive. Architectural researchers can explore multi-sensory knowledge, testing the spatial quality through the condition of a non-visual perception, considering invisibility.

This paper presents two qualitative research methods centred on invisibility. In order to increase the legibility of the text they are presented separately. Section two contextualizes, identifies and discusses a qualitative research method and tool applicable in user-centred design discussion groups. Similarly, section three presents the other method and tool, usable in walkthrough interviews.

2 USING INTERLOCKING BUILDING BLOCKS IN USER-CENTRED DESIGN

2.1 Context

User-centred design and co-design are useful approaches to address the quality of invisibility, integrating users' multimodal spatial perceptions. Moreover, Jones [5] states that in democratic societies architectural design requires an intrinsic involvement of users in the decision process. Making decisions that affect the life of people is impossible without their meaningful involvement. Co-design distinguishes itself from user-centred design by directly involving the user as expert in the design process. By contrast, in user-centred design the user is not necessarily directly involved, but can be represented by an expert [6]. Considering the case of a space for blind people, for instance, in a co-design approach, blind users are directly involved in the design process; in a user-centred design approach blind users can be represented by a fully-sighted expert with specific knowledge on the space's usability for blind people. User centred-design and co-design explore the boundary between

research and design practice, in the way of achieving qualitative knowledge through the users' spatial experience. Considering that user/experts may not have had design education, it is important to develop techniques and design tools that facilitate including their diversity of conditions.

In user-centred design and co-design working meetings, designers often use spoken language to discuss ideas, complemented with drawings. Drawings can be made and perceived by blind people if they are in relief, e.g., sketched on a special paper that produces upper relief using an assistive base. However, relief drawings are not that quickly perceived as physical models by blind people. Moreover, many users without architectural education may have difficulty in understanding drawings. By contrast, physical models have their intrinsic physical space and allow a more intuitive perception. Therefore, it is important to explore working models when discussing ideas, because they allow the flexibility of being built and rebuilt. In architecture physical models are often classified in two types: presentation and working models.

Many contemporary architectural designers/researchers seem to forget the potential of using working models when developing their ideas. Also, currently 3D virtual models are increasingly used instead of physical presentation models, despite the latter's inclusive potential in being perceived by blind people.

In architectural history physical models were used instead of drawings in the building process, even in cases of great complexity, such as the ancient Chinese cities Ming and Manchu on an urban scale, or single buildings like Gaudi's Santa Coloma and Sagrada Familia churches [7]. Also, in architectural theory, the use of models instead of drawings is important in order to explore the complexity of buildings' form and materiality in the design phase [8].

Some rare cases exist where working models replace drawings in a first approach to idea representation. Eero Saarinen referred to the use of clay models before any graphic interpretation, like in Michelangelo's design process, mentioning that the complexity and the plasticity of his work on TWA terminal in New York could not have been achieved by drawings only [7].

In literature we found four categories of drawing sketches, but no classification of working models: the thinking sketch is an individual representation of the thinking process; the talking sketch is a representation related with group discussion; the prescriptive sketch communicates the idea to persons not involved in a specific design process; and the storing sketch registers the design synthesis that works as a representation archive for future reference [9]. In our understanding the four types of working drawings can be applied to specify different types of working models. Accordingly, we will use the terms thinking model, talking model, prescriptive model and storing model.

When Carlos Mourão Pereira, the first author, became blind in 2006, he started to adapt his design process, using thinking models with materials like clay and Lego blocks in his architectural practice. Lego was used as material/tool providing a metric reference through the modularity of the interlocking studs [10]. A Lego piece does not differ too much from an assistive metric ruler for blind people, i.e., a tool with upper reliefs at equal distance supporting haptic perception of reference and dimension. The use of Lego drew the attention of several researchers. Heylighen [11] mentioned the usability of Lego in the representation of orthogonal structures in Pereira's design process; Vermeersch [12] mentioned the utility of Lego to provide a usable representation for quick rough tests.

However, Pereira also identified some negative issues, as the dimension of the Lego blocks, specifically in the modularity given by the studs, introduces an unconventional architectural scale [13]. For Pereira, it is important to use Lego blocks of the same white colour [14]. The main reason is that it speeds up the modelling process, avoiding time waste in selecting colour blocks without the need for assistive strategies, such as the use of colour separators with a single box for each colour. Also, he made prescriptive models with Lego blocks, to allow communicating ideas to his assistants who develop computer drawings. Some of these models were preserved for future use, becoming

storing models. Since 2008, when he began exploring qualitative research in architecture, he perceived the applicability of the mentioned types of working models.

From 2009 to 2011 he was teaching design studio in Erasmus intensive programs, in Portugal and Spain, organized by the Polytechnic University of Catalonia, and in France, organized by the National School of Architecture in Montpellier, centred on inclusive design. He used talking models in Lego, to explore ideas in user-centred design discussion groups with students, allowing to build and rebuild the Lego models during the ideas discussion.

Besides Pereira, we also found fully sighted architects interested in using Lego in academic meetings and research. In 2011, KRADS Architects developed for architecture students the workshop Playtime addressing the relationship of creativity and playfulness [15]. According to MVRDV's Winy Maas, this event inspired him to develop, with the students of the Faculty of Architecture of the Delft University of Technology, the project Porous City, resulting in 676 Lego towers, all in white Lego blocks, presented at the 13th Venice Biennale in 2012 [16]. This research project, developed with the Lego group, centred on the potential of porosity in skyscrapers design in the context of urban density [17]. In our understanding, these models are storing models achieved by the evolution from thinking models, establishing a relationship with presentation models, exploring visual aspects in the search for the building envelope. Maas appreciates using Lego for its playfulness, introducing the element of joy, allowing a useful psychological dimension, making even the most serious research more bearable, and also for its relatively low cost in comparison to 3D modelling [18].

2.2 Results

The two editions of the Erasmus intensive programs in Portugal and Spain were coordinated by Marta Bordas, an architect researcher and wheel-chair user. Bordas [19] states that these programs aimed to explore design creativity, through involving architecture students and teachers of different nationalities, towards an inclusive society, where architects need to take the responsibility to generate spaces for people to use according to their individual aspirations and needs. The design studio classes of these programs were developed in a classroom with a discussion table for each teacher, with students subdivided in several groups, including different nationalities. They developed their work moving from teacher to teacher. At Pereira's discussion table, Lego blocks were introduced as a main tool to discuss design ideas. Students considered his condition of blindness as an interesting source of experience and spatial knowledge, taking the opportunity to explore information about usability for blind people. Students acted as designers, in a position near to qualitative researchers, asking Pereira about his spatial needs with the objective to explore innovative morphologies, integrating invisibility towards multi-sensory inclusive spaces. During these discussions, talking models made of Lego were quickly built and rebuilt, changing hands between students and Pereira, resulting in the development of new ideas.

During three years of these workshops, involving a total of 93 students of nine different countries, it was possible to confirm the mentioned advantages of Lego use in architectural design, as well as to identify three limitations of the use of Lego blocks as a material/tool for talking models. The first limitation is the already identified difficulty related with the specific scale of Lego blocks. The 8mm distance between the studs introduced difficulties to compare the talking models with other representational artefacts on conventional scales. The second is the presence of the Lego logo on top of the studs; some students questioned the utility of this marketing strategy. The third is the haptic discomfort in the recognisability of Lego blocks in a fast and continuous handling. Pereira identified the combination of the harsh edges of the cylindrical studs of the blocks with the Lego logo upper relief and the relationship between size and distance between studs as the factors that can make the usability of Lego as talking models for blind people difficult.

To avoid the mentioned limitations, Pereira developed a prototype that explores a new design of interlocking building blocks. It introduces a distance of 10mm between the studs, allowing to produce models on a conventional scale. The top of the studs is semi-spherical, without any harsh edges or commercial logos, increasing haptic quality and neutrality without imposing commercial references.

2.3 Discussion

Our work illustrates the multi-sensory potential of using working models in qualitative research and design, specifically talking models in user-centred design discussion groups, using Lego as a material/tool. Our research is in line with that of Sanders and Stappers [20] who mention the interest in the development of co-designing tools and techniques, and the need for exploring tools to be used by non-designers to express themselves creatively.

It is important to remember that the design of Lego was conceived to function as children's toy, so to function as a material/tool for co-design research, it will require adaptations. Therefore, we proceed to consider how innovations in Lego blocks have been developed.

The earliest known plastic toy of interlocking building blocks is Batima made in Belgium in 1905 [21]. The blocks produced in 1930 are different in size from Lego however the interlocking studs are designed with a similar cylindrical form. Another interlocking building blocks system is that by Kiddicraft, a UK company founded in 1932, beginning with wooden toys production, and later producing plastic toys designed by the British child psychologist Fisher Page [22]. The Kiddicraft blocks of 1947 have a similar size as current Lego blocks being possible to interlock themselves, the only difference is that the Kiddicraft studs have a semi sphere on top instead of the Lego logo.

Similarly to Kiddicraft, the Danish company Lego, founded in 1934, began with a wooden toys production, and only in 1949 started the plastic interlocking blocks production. Lego is said not to have invented the plastic building piece, but to have been inspired by Page's original design [23].

The contemporary innovation process used by Lego involves user communities, which give input for the development of new products, building techniques and projects, motivating the manufacturer for future product developments [24]. This design process includes consumers, in order to receive feedback for the development of new products in a dynamic relationship with changing trends [25]. Lego communities are not limited to a specific age group, since many adults use Lego as a hobby.

However, the specific performance of Lego as material/tool in producing talking models is a new and specific use, which will require a new design considering the limitations identified.

The prototype of interlocking building blocks developed by Pereira explores a new dimension of the blocks, between the ones by Batima and Kiddicraft and Lego (Fig.1), to allow building models on a conventional architectural scale. Also he developed a new studs design inspired by Kiddicraft, maintaining the presence of the semi-spheres at the top of the studs.

We expect that these studs without the presence of the logo label will better fit the use by researchers, considering that its presence can be an imposing unwanted commercial mark in the neutrality required by a working model to be used in scientific research.

Moreover, we need to consider that the modularity of interlocking building blocks has the power to inspire architectural design approaches. The pixelization of the Lego modules has inspired the creation of architectural projects with new morphologies, developing spatial flexibility in contemporary architecture works, like the Lego Towers and Lego House, both of Bjarke Ingels Group [26].

So, we argue that increasing haptic quality in all studs of the interlocking building blocks, avoiding sharp edges, may contribute to fostering more attention for ergonomic comfort in the materiality of the physical model which may contribute for a more multi-sensory conscience of the architects regarding the materiality of the built space that they are designing.

Fig. 1 Interlocking building blocks. Left: Prototype; Centre: Batima interlocking building blocks. Picture credits: Museum of Design in Plastics, Arts University Bournemouth; Right: white Kiddicraft block interlocked with grey Lego blocks. Picture credits: Brighton Toy and Model Museum.

3 USING ELICITATION MODELS IN POST-WALKTHROUGH INTERVIEWS

3.1 Context

In spatial qualitative research case studies are of great importance, especially empirical studies centred on the interaction between users and the space in use. Case studies integrate detail, richness, completeness and variance, meaning the condition of time evolvement in a concrete and holistic dimension [27]. A research method to study the quality of invisibility, integrating multi-sensory perception, is the walkthrough interview, widely explored in post-occupancy evaluation studies. . Walkthroughs provide researchers a deeper perception, mainly because it may provide a concrete reality of the space being used by the interviewees. The walkthrough promotes detailed descriptions of the space by the interviewee [28].

Complementing researchers' direct observation, Preiser [29] recommends photography to register important spatial attributes. However, visual recordings can introduce limitations, not just related with participants but also with other users of the space who can be visual or audio recorded, without being previously informed. This is mainly the case in some specific public spaces, e.g. bathing facilities. Researchers thus need to make ethical choices, specifically when using visual ethnography in contexts where anonymity needs to be preserved [30].

During interviews ethnographic researchers explore memory elicitation of participants using visual ethnography [31]. Researchers often seem to forget the inclusive potential of physicals model to be used during interviews. They can allow haptic perception by blind people, as well as visual kinaesthetic diversity by sighted users, who can explore different points of view. We argue that physical models allow more neutrality than visual ethnography, making the interview discourse more meaningful, and consequently allow to identify qualities related to invisibility. Physical models can express the essential spatial definition of the reality they represent. Assistive models for blind people are often used at different scales in urban representations, as well as partial models of buildings to perceive indoor spaces. Pietrzykowska [32] states that these models need to be made using simplified drawings, considering that haptics differs from visual perception: details that are

unimportant need to be eliminated and, by contrast, details that are relevant may need to be enlarged to guarantee perception by blind people. A model that allows blind people to perceive architectural concepts, also provides easy intelligibility for sighted people, having the potential of rediscovering the fundamental vocabulary of the model [33].

3.2 Results

In an ongoing research project we face the problem of visual ethnography being invasive, as we are studying a bathing facility in a health and well-being centre, where visual ethnography is not allowed due to its intrusiveness in the users' privacy. In this study walkthrough participants were required to wear bathing clothes which can limit the acceptance of volunteers if we use visual recordings. Often, we do not identify participants in order not to limit the freedom of their comments, mainly in the identification of negative spatial components.

Considering the mentioned limitations, instead of the real-time conventional walkthrough, we developed a spatial walkthrough experience with 9 blind participants, aged between 5 and 77 years old and 4 fully-sighted relatives of participants aged under 18. We have not used any audio or visual recordings. Instead we just listened to their comments and observed how they interacted with the space, followed afterwards in a different space by an interview with video. In order to aid interviewees' spatial memory, we used physical models of the space and developed a post-walkthrough interview with video recording. This avoided the mentioned limitations regarding privacy and anonymity, considering that we framed the visual images just on the physical model and the interviewee's hands (Fig. 2). With these physical models we improve the usability of elicitation artifacts, allowing spatial perception by blind participants.

Fig. 2 Post-walkthrough interviews with physical models.

The mentioned method shows several advantages and limitations. One advantage is that it allows to conduct interviews with a deep spatial experience, using spaces and situations where a conventional walkthrough interview with audio and visual recording cannot be allowed. Another advantage is the ability to gather more spontaneous information from participants during the walkthrough experience, which may be limited if it was audio or visually recorded.

Furthermore, this information can be verified through exploration in the post-walkthrough interview. However, we identified a limitation regarding the participant's spatial memory. A few times the interviewees forgot some spatial details, which they perceived during the walkthrough. But, paradoxically, this forgetting can provide interesting data, because the researcher can perceive a hierarchy in the participants' comments: if an issue is really important most of the participants will not forget about it.

3.3 Discussion

In some spaces researchers may not be able to perform real-time walkthroughs with audio or visual recording due to their intrinsic conditions. Often, a post-walkthrough interview can allow a close contact with the spatial reality which they are questioning. Flyvbjerg [34] states the importance of closeness of the case study to real-life situations, arguing that the distance to the studied object may lead to stratified knowledge.

Introducing representational artefacts in interviews, to obtain a deeper relationship with the experienced spaces, was already explored by visual ethnography, specifically by photo elicitation. This technique was explored by photographer John Collier Jr. in the 1950's and presented in a research developed with Alexander H. Leighton, an anthropologist, where pictures are presented to the interviewees as an aid to interviewing [35].

In our understanding, architectural researchers who only use visual representations in their studies may be more easily inclined to gather visual details from their interviewees. If physical models are used instead, these representations can support visual perception as well as other sensory modalities. Vermeersch [3] states that representational artefacts play an important role in the reality architects work in, establishing a relationship with their design priorities.

When architectural researchers visualize they are studying, they can be sensorily limited if they are using visual ethnography only. Our findings suggest that a post-walkthrough video recording interview, combined with the model elicitation, may contribute to a more inclusive and sensory rich ethnographical achievement, integrating the invisibility qualities of the space.

4 CONCLUSION

This paper has demonstrated the feasibility of using qualitative methods for an architectural researcher in the condition of blindness. Furthermore, the methodological adaptations developed allowed to identify two different methods and their inherent techniques. The interlocking building blocks in user-centred design discussion groups and the model elicitation in post-walkthrough interviews, both hold potential to contribute towards designing inclusive built spaces in a multi-sensory way.

There is motivation for future qualitative studies to be developed: one on the comparability between the presented prototype and Lego interlocking building blocks, in inclusive creative discussion groups; the other on the comparability between real-time conventional walkthroughs and post-walkthroughs interviews using spatial elicitation through physical models.

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