Human movement in Public spaces: The use and development of motion-oriented design strategies

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Abstract:
This ongoing doctoral project focuses on human movement in public space and how qualitative observation can lead to new insights into the architectural design process. With this study we endeavour to find a method to visualize human motion in relation to architecture so it can be communicated in an efficient manner. Moreover we explore how motion-oriented design strategies can be developed.

Through a literature review, this paper will look to the significance of human movement within the field of architecture and especially within outdoor, public spaces. Movement is conceived as a basic element, which makes it possible to experience our build environment and thus forms a key element in relation between man and architecture. Furthermore we will look to a range of existing types of movement notation throughout history.

This practice-based research project makes use of experiential learning methods. We will discuss a trajectory that was followed to set up some first spatial interventions and how these may lead to motion-orientated design strategies. Finally the outcome of these first test cases will be elaborated and evaluated leading us to new insights for further experiments.

Keywords: Human movement, Public space, Spatial interventions, Design strategies, Architecture

1. Introduction

An architectural design process is very complex in its nature and can be achieved in very different ways. This research project does not focus the process itself, but on how body movement analysis can shed a different perspective on this process and how we can interfere in it.

The human body and its intellectual and sensual capacities is central within the architectural design and are much-discussed topics in architecture theory. Yet, in practice we are most often dealing with static concepts of the human body (Hauptmann 2006). The common language which is used by architects to communicate their designs are drawings, models, sketches, computer visualisations,

etc.. None of these communication techniques incorporate or reveal the spatial quality of the human movement.

Although several architects and urbanist have studied the concept of human motion within their curriculum, such as Whyte[1], Gehl[2], Virilio[3] and many others, there is up on today little knowledge available for designers to consciously anticipate on human movement.

Similar to this study, PhD student Rojas (2015) at MIT attempted to understand the effect of spatial elements on human movement. She attempted to put this effect in rules and developed a space-motion metrics which formed the basis for her self-developed software. This software simulates the consequences of certain design-decisions on human movements. Different from Rojas work, this study rather strives to develop motion orientated design strategies, which enables designers to anticipate consciously on human movement in public spaces.

2. Context

2.1 Human movement in public space

In the context of this research, public space is understood as any outdoor, public accessible area in which all kind of movements can take place. A common movement which happens daily and mostly unconsciously is walking. Walking can be perceived as the most basic and routines form of movement, whereby we are able to displace ourselves from point a to b, but more essential in relation to the subject of this study is that through walking we bodily experience space.

As Wunderlich (2008) states: "it is while walking that we sensorially and reflectively interact with the urban environment, firming up our relationship with urban places." (p. 125)

Besides this sensorial interaction, walking is also characterised by certain pace and rhythm. We tend to walk more rapidly when we are hurried, but this shifting in speed, can also be the result of specific spatial configurations. Within this research we search for the characteristics of the spatial elements, which drive us to make a shift within our moving pattern.

De Keersmaeker (2015), dancer and choreographer, describes walking as one of her fundamental principles on which she has built several choreographies. One of her most interesting projects in the frame of this research is "*My Walking is My Dancing*", a workshop wherein she encourages people to walk consciously on a very low pace through Brussels. With this project she wanted to make people aware of their movements and make them experience the city from a different perspective. Beside she perceives walking as a form of dancing.

The former is consistent with the ideology of Lawrence Halprin, who recognizes under the influence of his wife Anna Halprin, dancer and choreographer, the importance of corporeal sensations of movement as a crucial factor of landscape design. Halprin searched on how he could actively effect on the embodied movement through his environmental designs. While his wife Anna Halprin was especially interested in the intersection between dance and architecture. She was a pioneer in taking

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[1] W. Whyte (1980) studies human behaviour and their activities (movements) in his book "Social life The Social Life of Small Urban Spaces"

[2] Similar to the work of W.Whyte, J. Gehl (1989/2013) observes the link between human activities that take place in public place and the spatial qualities.

[3] Virilio (2004) mentions in his book "The Function of the Oblique" the concept of experiencing architecture through movement and the quality of that movement.

dance and performance of the theatre into the public space. Their practices lead to new perspective on landscape design and dance performance. (Merriman 2010)

According to Gehl (1989/2013) there are different types of movement within the public space and they are inherently connected to the social activity. Gehl (1989/2013) distinguishes following types of activities: necessary activities, optional activities and social activities. Necessary activities are activities that happen regardless the environmental design, while the optional activities occur spontaneously due to the good conditions of the public space. It is within this type of activities that we observer human movement in public space.

2.2 Human movement visualized

The idea of notating movement as autonomous drawings, which freeze movement on paper, is an idea that knows a long history. Researchers in several fields and disciplines, as well as visual and performance artists, architects and designers investigated this phenomenon. Body movement has also inspired motion study pioneers such as Frank and Lillian Gilbreth (1911) and Eadweard Muybridge (1901), who used cameras, stopwatches, time-lapse and sequential photography and electric lights fastened to the limbs of their subjects to capture the flow of the body in images - representations of movement in space.

Laban (1966) was one of the first who developed a dance movement notation system (the labanotation), which could be used to analyse and record movement in relation to space. Few years later also Halprin (1969) invented his own movement notation system (motations) that would enable designers to work more kinaesthetically. Both systems unfortunately missed their target due to their complexity and therefore remained almost unused.

Whyte (1980) and Gehl (1989/2013), both architect and urban planners, used time-lapse video recordings to generate charts containing time sequence and duration of different kind of movements in public place. They used these charts to understand the relation between urban spatial configurations and the human activity that took place.

Space Syntax is also an example of a methodology to represents human movement on paper. This method is integrated in open-source spatial Analysis software that visualizes movement patterns on the scale of a city. This method is mainly used in the field of urban development to understand and forecast the impact of the location and morphology of certain urban configurations (Hillier 1996). In contrast to this research project, Space Syntax looks only to traffic (pedestrians or motorized movements) trajectories in topview. We believe that a lot of knowledge get lost when only topview visualizations are analysed, for this reason we look to the three dimensional image, which also tells something about the height of spatial elements and is more focused on the quality of the occurring movement instead of the quantity.

The sustained interest in body movement, right up to the present, with state-of-the-art digital motion capture systems having become available for scientific use (marked motion capture systems) and to the general public (e.g. Kinect), attests to the validity and benefits of these techniques for the study of movement in relation to spaces. Rojas (2015) for instance uses Kinect to collect data from people's motion in public space. Although this technique is promising and easily accessible it also has some disadvantages especially for the application in public space. The depth range of the sensor is only 3.5 m, which is quite small considering the dimensions of an average public space. That is one of the main reasons why decided to make only use of traditional camera recordings for the observation of body movement.

3. Methodology

This study is practice based in its nature. The method that we use is grafted within experiential learning. We make use of the Lewinian learning model (see figure 1), where the main idea consists of actions and reflection on the actions, which forms a base for the following actions. Learning/understanding is conceived as a four-stage cycle, as shown in figure: "Immediate concrete experience forms the basis for observation and reflection. These observations are assimilated into a "theory" from which new implications for action can be deduced. These implications or hypotheses then serve as guides in acting to create new experiences."(Kolb 1984) Translated to this study this means that through observation and reflection on human movement (the concrete experience of people) some abstract concepts will be expressed in the form of preliminary design strategies. These design strategies will be tested as design interventions from which new situations derives. These situations again will lead to new experiences whereby the process can be repeated.
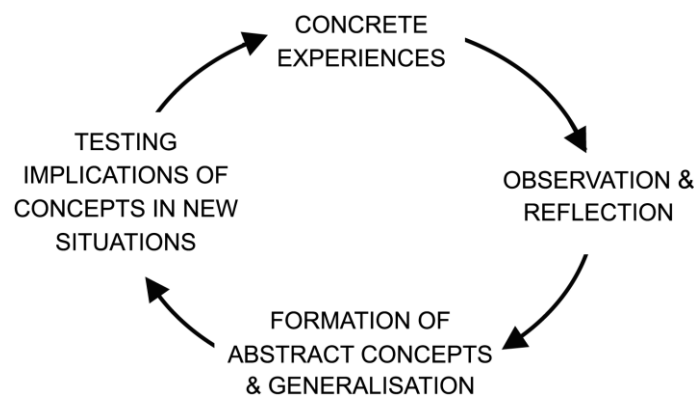

Figure 1. Lewinian learning model (Kolb 1984)

Furthermore we search for design strategies to provoke a quality in participant's movement. Different from Gehl's study we look for qualitative data in human movement. The term Qualitative movement diagnosis (QMD) is introduced by Knudson in the field of kinesiology and is defined in his book as followed: "systematic observation of the quality of human movement for the purpose of providing the most appropriate intervention to improve the performance."

We believe that through continuous practice in movement observation in relation to spatial elements, we will develop certain skill to recognize qualities or enhancements in the body movement. This skill will lead us to better and more accurate interventions since the above described method is iterative and will continuously be repeated. In the scope of this paper we only focus on the preliminary experiments, to test the proposed method.

4. Preliminary Experiments

4.1 Context

In a previous course of this research project (Vroman et al. 2011/2014) two main categories of interventions were developed. On the one hand there are two-dimensional interventions of tapelines, which only intervene on the floor level. And on the other hand there is an addition of

three-dimensional objects, which rearrange or disturb the existing space. Both categories exposed to have certain effect on the human movement. These previous setups were exclusively tested in indoor spaces and additionally participants were aware of the fact that they were taking part to an experiment. In this paper only the second described type of interventions will be tested.

Currently we put the research into a different perspective. We do not longer look to indoor spaces. We now focus on outdoor public spaces where participants are not aware of the fact that they are taking part to an experiment. First some explorative observations were done in a busy square. From these observations first reflections lead to several manners to intervene in the public realm, which may have an effect on the quality of human movement. During these observations we noticed that for instance some people walk rapidly and slow down a little later, while others rather meander on a constant slow speed. These fundamental different ways of moving, results in a different experience of the space. We also noticed that the moment we take a pause and observe the occurring human movements, our experience of that place is fundamentally different comparing to being a part of the unconscious flow of movements. In this sense this experience can be compared with the slow-walking project of De Keersmaeker where the very low pace of walking brings another experience of the city, where meanwhile the other activities continue on the usual speed level. The challenge within this research project is to discover design strategies that make it possible to generate similar experiences with the aid of spatial elements.

During our observations we looked through the eyes of an architect and searched for already existing spatial elements that may have specific effect on the quality of the movement in the observed square. We discovered for instance that the benches were placed a small step higher than the rest of the square. This small difference, which is not noticeable in one blink of an eye, makes a fundamental difference in the experience. The moment that the benches are approached, participants are forced to slow down a little. Moreover the difference in height seems to create a separate space on the square.

Subsequently we searched for public spaces with certain specific characteristics, where we could develop temporal interventions. The chosen public places (see figure 1) have well-defined and similar characteristics, we named those places hybrid places. The places have the following characteristics in common: they emerged from a restructuration in the street pattern through time and were literally cut from the rest of cityfibre through delimitation posts or concrete blocks, while the street facilities remained unchanged. As a consequence, these spaces do not allow an instant reading by its spatial appearance. The investigated hypothesis is that by using motion-orientated design strategies we can fundamentally change the spatial qualities related to movement and dynamic.

Figure 2. Two examples of the chosen hybrid spaces (photos from the author)

In this stage of the research project we search for temporal interventions that could generate a specific moving pattern, enhance the quality of the movement and the experience of space. The first design interventions were done in the courtyard of the Faculty as a first trial. This space can be perceived as a micro hybrid space, due to its none defined spatial character. The courtyard is mainly used as transition area between the entrance, the administration building and the main building of the school. As most of the people are only passing in this area and move directly from one door to the other, we search for interventions that could make people to slow down and rest or to change trajectory, speed, pace and rhythm.

4.2 Design of the interventions

Inspired by Halprin (Hirsch 2014) the design of these interventions was interpreted as making a choreography. We believed that we no longer should interfere in space exclusively from the background of an architect. This idea sprouted from the fact that on the moment we attempted to start the design of the temporal spatial interventions, we noticed that we could not bear on our imbedded architectural skills. Most commonly the architectural design process starts with an analysis and drawing of the measured existing space. The moment that we put this measured space on paper, we get an empty fixed space with the absence of human movement. Besides we rather strive to design movement instead of space. Space and spatial elements will only be deployed as an agent to generate movement.

As mentioned earlier in this paper De Keersmaecker (2015) determines walking as a form of dancing. As a consequence we could envisage the sequence of movements of participants in public space as a kind choreographed performance. It was also Halprin who compared the public space with a stage where on the public life is performed (Hirsch 2014). *A Choreographers Handbook* (Burrows 2010) formed the basis to take our role as a choreographer, since we do not have any skills in making choreographies. The book exists of a range of terms which are related to the craft of choreography. Burrows (2011) explains in the beginning of his book that he has no experience in writing books, since he is a choreographer and performer. Therefore he wrote the book as how he would make a choreography. In this sense his book also is an interesting example of how we can transform from the role of an architects to the role of a choreographer. One of the concepts he describes is "habit". He explains how choreographers have some habits whereby they tend to lose the meaning of certain movements. He argues that the only way to handle these habits, is through consciously breaking them. This argument also makes sense for designing movement with the aid of spatial elements. Therefore we broke up our habitual architectural design process. We no longer started from measuring the existing space, neither sketching nor drawing. To design movement it is essential to well-understand the already existing human movement that occurs in a specific place, in this case the courtyard of the school. The process of understanding started by consciously walking through the space and by recording the already existing movements, which serves as a baseline to compare with. The above described actions are the *concrete experience* where we refer to in the experiential learning model. They lead to a first reflection, which was the trigger for a first range of interventions. We noticed that people mainly walked parallel with the wall and rarely used the right door (see figure 3).

Architects usually make sketches of their first ideas, our first set-ups could be interpreted as preliminary concept sketches in which we attempt to break with the current moving pattern and observe how an interesting dynamic and quality in the movement can be generated.

Figure 3. Different experimental compositions in the courtyard (videostills from the author)

4.3 Set-up

The aim of the below described set-ups was mainly to comprehend what the impact could be from temporal spatial interventions. We used two white blocks with following measurements 40 x 40 x 105 cm to make three different compositions (see figure 4). We observed if there was a noticeable difference in the quality of the movement between the three compositions. Each composition was set-up for half an hour and was the result from the reflection on the previous observation. One video camera was positioned on a tripod on a height of 1m50 in the corner of the courtyard.

Figure 4. Different experimental compositions in the courtyard (videostills from the author)

Composition 1

The blocks were placed vertical, one block was positioned central in front of the right door and the other one at the inclination point just before a tree with still some space in between the tree and the block.

Composition 2

The composition of the blocks is very similar to the first composition. The block in the front was moved closer to the wall and the other block was positioned in front of the handle of the door.

Composition 3

Both blocks were placed horizontal on the main pathway, one in front of the door and the other one at the height of the tree.

4.4 Observations and reflections

With the different compositions we intended to make participants to slow down, to rest or to change trajectory, speed, pace and rhythm and enhance the quality of their movement. From this first set of sketchy interventions following observations and reflections resulted:

The various compositions seemed to have an impact on the trajectory of the participants. The most remarkable effect was that the left door was being used more frequently in all three cases and consequently, there has not only been walked in parallel with the wall. Users crossed each other, for instance, while they would usually pass by each other (see figure 5, composition nr. 3).

When the blocks were placed horizontal on the pathway, they formed a larger obstruction than when they were placed vertical. Although the visual obstruction is less present with horizontally placed blocks, the right door was not even used anymore within composition 3.

Figure 5. Movements in different experimental compositions in the courtyard (videostills from the author)

The rhythm, pace and speed of the movements seemed to be barely or not affected by the tested compositions. Although there were some participants who slowed down to look at or to touch one of the blocks. Hence we could consider placing visual or tactile attractive objects to generate certain change in the speed of the participant's movement.

The quality of the movements seems to change depending on the composition. The initial parallel and linear movements changed to slalom and more angular movements. To find out whether the quality of the movement had been improved in one of the three composition, it is necessary to do some further experiments at the same location. Additionally, it appears to be required to convey some experiments with feedback from the participants. Therefore we consider to organize a workshop in the courtyard. Different from the executed experiments, participants will be aware of taking part to the experiment. This will make it possible to have a conversation and discussion with the participants and to develop new insights with regard to the spatial experience. We could immediately anticipate on specific movements and ask for instance what he/she was experiencing when he/she was touching the block while passing.

Overall the main observation of the above described preliminary experiments is that the placement of 3D objects, in this case white blocks, may make a fundamental change in the trajectory of the participants.

5. Conclusion and discussion

The use of the Lewinian Learning model (Kolb 1984) provides an explorative and somehow intuitive learning process. It allows to test different setups without establishing well-defined objectives. However the observations and experiments are currently very basic, they give a first impression of the potential opportunities in this ongoing research project.

It appears to be necessary to formulate more accurate parameters in order to enhance the quality of the observation and evaluation of the movement. We believe that participant's movement are more spontaneous when they are not aware of their participation in a study, however it will be necessary to have a conversation with the participants in order to obtain some feedback on their spatial experience.

In addition, Adobe After Effects will be used for detailed video annotation to illuminate space related aspects of human motion. Currently we only made use of video stills, where these aspects are not present, and therefore cannot be communicated. Despite the above mentioned shortages, these preliminary experiments resulted in some first suggestions for possible design strategies which should be tested further. For instance, the placement of semi-high elements, could break or change the trajectory, while the use of visual and tactile attractive elements may decelerate the movements.

The challenge for the next series of experiments mainly consists of finding a combination and sequence of design strategies whereby a kind of choreography is designed, that my result in an improvement of the experience of space and enhance the quality of the movement.

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