Enhance Understanding of Space in Urban Planning through Game-Inspired Orientation Tools in VR

To provide a better quality of life and place, urban planning needs to adapt to the rapid growth of population and the resulting global urbanization \citep{MOURATIDIS2021103229} \citep{Trip}. Creative and transdisciplinary movements are already working towards a sustainable and inclusive future and bring experts, businesses, institutions, and citizens together to address complex societal challenges through co-creation \citep{NEB}. Such participatory planning with community involvement positively affects decision making and getting those decisions and design choices accepted and tested by different members of the community (including non-experts and citizens) can lead to a better working environment \citep{MAFFEI2016338}.

Virtual Reality technology can help this public consultation process and has the potential to foster stakeholder participation \citep{VR1}.This technology’s representation of the real world is a superior way of communicating and understanding the environment compared to mere description, and in creating a common language and empowering participants it helps the design and urban planning process \citep{VR2} \citep{ALKODMANY199937} \citep{VR3}.

Being able to present additional information about the urban planning process, makes it an effective tool for communication plans and knowledge exchanges. This improves transparency.

But to successfully present this information so non-experts are able to look and participate in the urban planning process, it needs to be prepared and presented in a comprehensive way \citep{urbanplannin3D}.

Multiple studies have already been conducted about the depiction of the environment itself, focusing on the influence of realism, sound, and light. Therefore, this paper will focus on different characteristics. Designing and planning a place is a dynamic process and its effectiveness relies on the human perception \citep{urbansci2020034}. Among other things, places can be characterized by their distinct cultural, social and economic attributes \citep{THOMAS2023104111}.

This paper will focus on how to communicate those attributes most effectively so that this knowledge might later be used for urban planning purposes.

The tools to realize this goal will be inspired by orientation and navigation systems predominately found in video games. Videogame environments are complex and require players to orient themselves in multiple environments such as buildings, natural settings but also city streets \citep{DECASTELL2019102895}. They are visually realistic environments that evoke the same spatial abilities needed in the real world.

The game-inspired orientation tools this paper will focus on are markers in the user's field of view and a compass bar. In addition to those two tools, a more conventional orientation method, a map, will be added to the virtual environments. All three orientation tools will be compared in their ability to communicate information about the given space and how the understanding of the places differs between them.

For this purpose, the available amenities of the places will be classified into the previously mentioned attributes that characterize a place (cultural, social, and economics).

Participants will experience one of these three implemented orientation methods in the same place. A questionnaire will then highlight how well those tools can communicate the information about the space.

--- TODO: Aufbau der Arbeit beschreiben - später dann -----

Related Work

**What makes a place**

**---** Start with space and work to place

The cultural geographer Yi Fu Tuan defined place, and its accompanying differenced to space, as one of perception. Whereas space refers to environments with little meaning and emotional attachments to the beholder, so is place the opposite. A place holds value and importance to its users due to their personal and collective experiences. It is human interaction, activities and emotional connections associated with a space that transform it to something more [4].

Factors that contribute to this creation of a place are natural assets, narrative, reputation and political actions, local traditions, historic buildings, available sensory enjoyment and comfort but also availability of goods and services [4, 5]. Castello therefore concludes that the perception of a place is influenced by socio-cultural stimuli (narrative, history and tradition), morphological-imaginary stimuli (natural assets, beauty, reputation) and enjoyment-functional stimuli (services, utilities, sensory enjoyment), all three of them a result form the interaction between people and their environment.

The concept of place has been explored across diverse disciplines, including geography [6] [7], cultural anthropology [8], architecture [9], leisure studies [10], and forest science [11]. As the internet continues to permeate daily life, new areas of study such as educational technology and virtual places are emerging, further expanding the understanding of how people relate to and connect with places.

But quantifying the relationship between a physical environment influences and a person’s emotional experience has always been a challenge [1]. This emotional relationship between people and places is called “sense of place” [3]. Earliest studies on SOP were made in urban design and social science and Hu & Chen believe, that it is something possessed by everyone, connecting us to the world. It is an essential part to our environments experienced and is defined by a places physical, social and economic attribute [1] [5] and as such integrates three intertwined components: the physical environment, human behaviour and social or psychological processes [13]. The sense of place is individual, the result of human interaction with the environment [14] [3] and is a cognitive, affective and evaluative relationship [5]. A relationship that plays an important role in urban architecture [1]. In including not only the physical environment but perception and inter-human interaction, Hu & Chen argue that it could result in creating both meaningful and effective places [1]. Creating a sense of place and community is a fundamental principle in creating a sustainable and high-quality built environment. It serves as an important building block in designing environments that prioritize sustainability and quality of life [1] [3].

--- damit die planung, und cooperative plannung funktioniert, müssen leute auch diesen Teil des ortes verstehen – jedoch ist es ein sehr vages concept, schwer rüber zu bringen vorallem weil es so individuell ist --- even more so in VR – our primary medium (mehr dazu in kürze), warum, weil nur so kurz da- 15 unten --- aber --- teil 5 (steht nicht allein, environment muss es zur verfügung stellen) --- das ist die information, auf die sich diese Arbeit konzentriert

15 Sense of place does not equal presence but is a factor that influences it. we propose that the sense of place might reasonably and usefully be considered as a further content factor. However, existing place theories and empirical work lack a consideration of how people experience places that are only encountered relatively briefly, rather than being the subjects of long-established residence or long-term attachment. Such aspects of place experience are much more directly equivalent to most VR experience.The challenge is to identify which aspects of place can best survive their translation into virtual reality given its constraints

5 While the social, cultural, and psychological elements are undoubtedly key, they cannot stand alone. Says Stedman (2003), “Although social constructions are important, they hardly arise out of thin air: The local environment sets bounds and gives form to these [social] constructions” (p. 671). The physical setting provides the context—as some have called it, the “stage” (Basso 1996b, p. 66; Steele, 1981, p. 14)—for human/environment interactions

--- Place to sense of place / spirit of place

Sense of place, spirit of place, attachements

To recreate this, a person needs information, memorie, layout etc

\*\*constructing and making a place is dynamic, and the effectiveness of the place depends on human perceptions of the space, social interactions, economies, cultures, and histories\*\*.

 \*\*Economies, Cultures, and Histories\*\*: It also states that place is influenced by economies, cultures, and histories, suggesting that these elements are vital to understanding the essence of place

 https://www.jstor.org/stable/pdf/24706959.pdf?refreqid=fastly-default%3A0093c0eabcf13d7bb520d4d2e0e15a2a&ab\_segments=&origin=&initiator=&acceptTC=1

**Argumente** für inwiefern diese arbeit die sense of place enhancen kann: Place is influenced by economies, cultures, and histories, suggesting that these elements are vital to understanding the essence of place 2

Warum die **Karte**? – classical tool für orientation, welches tool eignet sich am besten, diese Info rüber zu bringen

**VR in Architekture**

Sense of place in Vr

Why in VR

Perception in VR

Virtual Environments in Architekture

Integrating game inspired orientation tools like **markers** and **compasses**, when communicating information about the given space, will, **compared to map-based systems**, significantly **enhance** the user's **understanding of the place**, regarding available amenities.

1 a framework for understanding sense of place in urban design (<https://doi.org/10.3390/urbansci2020034>)

2  <https://www.jstor.org/stable/pdf/24706959.pdf?refreqid=fastly-default%3A0093c0eabcf13d7bb520d4d2e0e15a2a&ab_segments=&origin=&initiator=&acceptTC=1>

3 the concept of place and sense of place in achritectural studies [doi.org/10.5281/zenodo.1082223](https://doi.org/10.5281/zenodo.1082223)

4 rethinking the meaning of place - <https://doi.org/10.4324/9781315606163>

5 toward an interdisciplinary understanding of place – article <https://cjee.lakeheadu.ca/article/view/508>

6 justice, nature and the geography of difference - <http://dx.doi.org/10.1080/10455759809358787>

7 space, place, and gender - <https://www.jstor.org/stable/10.5749/j.cttttw2z>

8 place attachement - [10.1016/B978-0-08-047163-1.00543-9](http://dx.doi.org/10.1016/B978-0-08-047163-1.00543-9)

9 buch - <https://www.scribd.com/document/422089064/Hayden-the-Power-of-Place>

10 [https://doi.org/10.1080/01490409950202285](https://psycnet.apa.org/doi/10.1080/01490409950202285)

11 <https://www.jstor.org/stable/24707499>

12 a sense of place in immersive architectural virtual heritage environment <https://doi.org/10.3390/urbansci2020034>

13 is it really just a social construction? <https://doi.org/10.1080/08941920309189>

14 genius loci landscape architecture <http://hdl.handle.net/10492/3583>

15 [10.1162/pres.2006.15.2.204](http://dx.doi.org/10.1162/pres.2006.15.2.204)

16 measuring sense of place [10.1111/j.1467-9663.2005.00479.x](http://dx.doi.org/10.1111/j.1467-9663.2005.00479.x)