# Master Thesis Exposé - Virtual reality to stimulate reflection on barriers: The KIT Campus as a case study [[Virtuelle Realität zur Stimulation von Reflektion über Barrieren: Der KIT-Campus als Fallstudie](https://campus.kit.edu/sp/campus/all/event.asp?gguid=0x3D6172F21FC44BD58BC56E764B2F2BA1&csbrguid=0xA511F9A90CC0423A94CC24B4AF95C00B&tguid=0x40B784B43AED4CC9857335104533EDFB)]

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Introduction and literature review

To improve students’ critical thinking and awareness towards architectural barriers for disabled people on campus, a virtual environment reproducing parts of the KIT campus will be designed, aiming at promoting reflection on the topic of accessibility. Within the simulation, the users navigate a partial reproduction of the KIT campus while being instructed, through examples and explanations, on what is considered an architectural barrier and what is, instead, an adopted solution to favour accessibility.

Different physical barriers on campus prevent specific groups of students from having the same experience and utilising the same services as their peers, making some services inaccessible, assistance necessary, or diminishing their overall experience, limiting what students have access to, and how they perceive their needs and rights are considered.

Common examples of architectural barriers for people in a wheelchair or with limited mobility are steep ramps, heavy doors, elevated thresholds, and similar constructs [1], however, a wide variety of design choices can create obstacles for different groups of disabled people that, for example, have limited dexterity, have visual or hearing impairments, or are neurodivergent.

Virtual Reality has been used in the past with the goal of educating people [1] and raising awareness on the implications of disabilities [2], but with the focus on simulating the feeling of being disabled while exploring the environment. The result was that the conveyed view of reality was distorted, and stereotypes reinforced. Increasing sensations of helplessness and vulnerability, such simulations caused the users to imagine how limiting a disability can be, instead of showing how architectural barriers and design choices can be a source of restrictions [3], preventing environments from being accessible for everyone.

However, there is potential in solutions that use Virtual Reality to educate people about barriers; the project’s goal is to use the immersive experience of exploring a digital replica of an exemplary building or outdoor environment on the KIT campus is an enriched version of reality, containing interactive and playful elements, to raise awareness on barriers and stimulate reflection on how common spaces could be improved to favour inclusion. Juicy design elements will be used to improve player experience and increase the simulation’s aesthetic appeal [4]. Mechanics that allow users to get more information on the encountered barriers, a progress bar to show progress within the simulation, and other visual embellishments are examples of tools that may be used to increase curiosity and immersion, improving the involvement with the simulation.

Project scope

Many factors and choices are involved in the design of a simulation, such as the addressed disabilities, the size of the reproduced area, the represented season, and the approach for the building’s representation, either from the inside, the outside or both. Further analysis is necessary to precisely define the features of the virtual replica, but a preliminary list of relevant variables includes:

1. Groups of disabilities:
   * Use of Wheelchairs
   * Limited mobility
   * Limited upper body mobility/dexterity
   * Visual impairment
   * Hearing impairment
   * Neurodivergence (ADHD/Anxiety/Autism)
2. Size of the simulated area:
   * Exterior of a building complex with less detailed features (example: campus area including AKK, library, mensa and connecting garden)
   * Single building represented in detail (example: mensa building)
3. Interior/exterior perspective:
   * Building(s) indoor view
   * Building(s) outdoor view
   * Building(s) outdoor and indoor reproduction with possibility of analysing the transition from inside to outside and vice versa
4. Season of the year:
   * Autumn with leaves on the street and wet surfaces
   * Winter with cold temperature and snow
   * Summer with hot weather and potental difficulty to stay in the sun for prolonged periods of time
5. Time of the day:
   * Crowded times during the day
   * Unavailability of services during different hours of the day

Research Questions

The goal of the project is to address the following three research questions:

RQ1: what design features are required to accurately simulate the experience of moving in the designated campus area while encountering different architectural barriers?

RQ2: how can interactivity mechanics and playful elements affect the player experience and his perception of the simulation?

RQ3: does the simulation have potential to trigger reflection and how is reflection affected by the interactive and playful elements?

Method

The project is articulated in five consecutive phases, taking advantage of a collaborative methodology to design the virtual environment prototype and to evaluate the effectiveness of the developed simulation in stimulating reflection on the topics of architectural barriers for different disabilities in a university environment.

Through interviewing the Disability Awareness Consultant at KIT, a list of barriers affecting people with different disabilities will be compiled and relevant features to include in the simulation will be identified.

Afterwards, the guidelines obtained from the collaborative design are used to develop an initial version of the virtual environment, that reproduces the chosen campus section with the identified barriers and contains the basic interactivity mechanisms of the simulation.

The prototype’s accuracy in representing reality and the effectiveness of interactive/playful elements is then tested by a non-overlapping group of consultants to ensure that the representation of barriers is appropriate, and that the desired prospective is conveyed, addressing RQ1 and RQ2.

The gathered comments and suggestions on how to improve the virtual reality experience are then used to polish the prototype in a second iteration of development, obtaining 2 final versions of the simulation, one with and one without embellishments.

Finally, the most recent versions of the simulation are presented to a group of architecture or design students and their experience with them is assessed through standardized questionnaire followed up by a semi structured interview to analyse the effectiveness of the simulation and of the juicy elements to trigger reflection and encourage transformative thinking, aiming at answering RQ3.

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