# The design of a VR-setup for a virtual journey to the salt caverns of Twente

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This bachelor assignment involved the design of a virtual reality setup for the Delden Salt Museum, presenting a virtual journey to the salt caverns in Twente. The museum is established in an eminent building in the historical city center of Delden. Since the opening of the museum in 1985, the regular exposition is renovated twice. At the latest renovation in 2008, there was special attention for the incorporation of audiovisual presentations into the exposition. This reflected in the application of several displays and interactive installations.

Ever since the latest renovation occurred, there have not been significant changes to the regular exposition. However, this timespan does know some vast technological improvements. The museum is interested in applying innovative technologies to add subjects to the exposition, and to enhance the quality of the current exposition. It sees potential in the application of VR and AR technology.

One of the subjects that are up for renovation is *salt caverns*. A salt cavern is a large hollow space deep underground, formed as a consequence of salt mining in Twente. More than 200 caverns can be found under the soil of Twente, some as large as a football field, and up to 20 metres high. One may find it difficult to imagine what these caverns are like. Therefore, the museum wants to help visitors gain insight into the salt caverns in Twente.

The following aim is defined for this assignment:
*Design an interactive setup that allows visitors of the Delden Salt Museum to acquire a realistic impression of the salt caverns of Twente using virtual reality technology.*

The design process consisted of an analysis phase, a conceptual phase and a final concept phase. Mid-fidelity prototypes have been utilized during multiple stages of the design process to provide additional insight.

It was important to select a technology that would enable a high level of immersion. Two VR-technologies are suitable within these boundaries: HMD-based VR and Projection Based VR (PBVR). HMD-based VR requires multiple high-end head mounted displays. PBVR relies on 3D-projection technology to immerse one or several users into a virtual environment. Ultimately, PBVR was

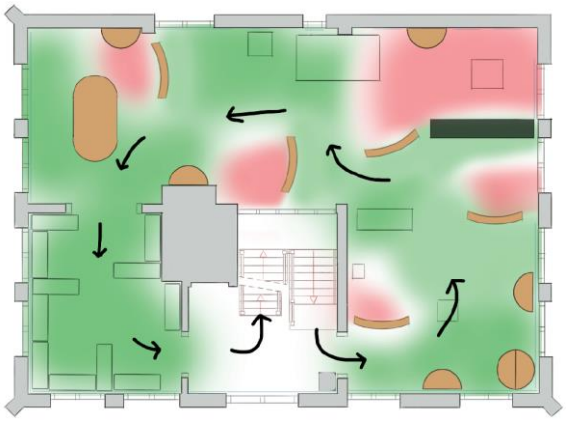

**Figure 1. The heatmap indicates a large section to be improved at the top right corner.**

selected based on the costs and the suitability for this application.

To substantiate the design, a suitable location had to be chosen. The most important aspects hereby are available space and the place in the overall storyline of the museum. Eventually, a corner on the second floor was decided on, based on an analysis on the line-of-sight and walking route, as can be seen in *Figure 1*, and the subjects that are part of the regular exposition. The location currently covers caverns and salt mining in Twente, therefore, the overall storyline of the museum will remain.

The information on caverns and salt mining in Twente can be categorized into: *history*, *excavation* and *production*. In the new situation, these categories will form three areas. The designed shape will implicitly help the user navigate the subjects in the correct order, as can be seen in *Figure 2*, and ensures that there is enough space to display the current information and artefacts. It also leaves space for a PBVR-room, suitable for the VR-presentation. The room will take visitors on an interactive story, consisting of an introduction in the control room, visiting a salt house, a trip along the multitude of soil layers and an exploration inside the salt cavern below the salt house.

A Leap Motion controller allows the visitors to explore the virtual salt cavern (*Figure 3*) themselves, where they will acquire additional information on salt excavation in Twente. A passive 3D-projection system will display visuals on a curved wall of 3,2 x 2 metres. Inside the room, visitors will wear a construction helmet with built

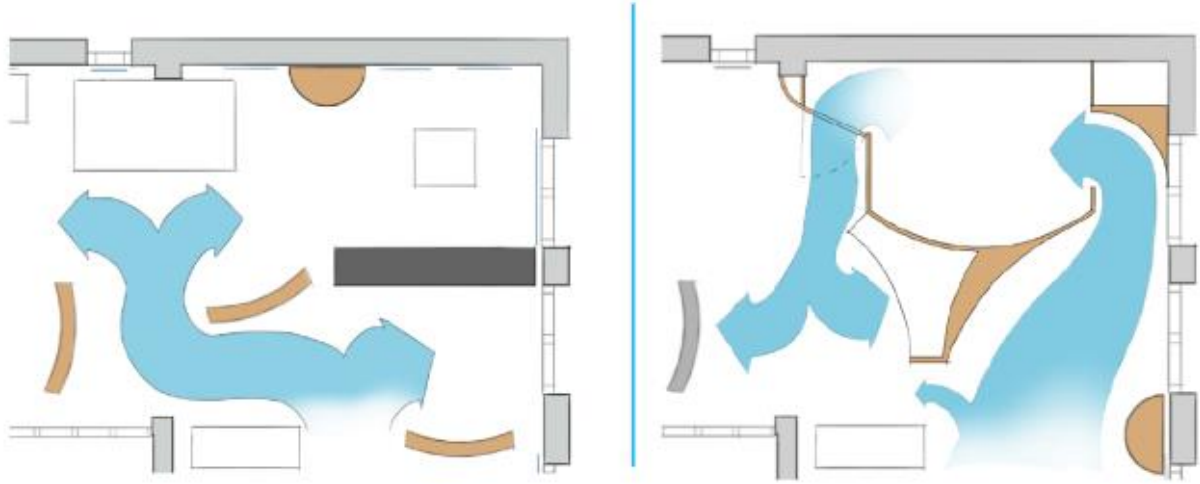

**Figure 2. The new situation (right) aims to improve visitor flow.**

in safety goggles. The necessary polarized filters are integrated into these goggles. Automated lighting, a 5.1 surround sound system and a wind effect support the projected imagery.

The final design fulfils the project aim without devaluating the current exposition. It improves the walking route by guiding the visitors implicitly, and the amount of niches is reduced, without harming the overall storyline of the museum.

Unfortunately, the design is not yet worked out in sufficient detail to start production. For instance, supplementary design work must be executed on the construction as well as preparatory work on the practical implementation of the design within the museum. Also, there is need for a detailed design of the virtual environment, which subsequently is to be translated into an interactive application.

All in all, the design can potentially become an initiator of new visits, which could be profitable to the museum for multiple years to come. Therefore, the main recommendation is to continue the development of the installation. One of the options for the museum is to supply two new graduation projects: one for the physical design, and one for the virtual design.

Another option could be to outsource the development activities to specialized companies, for example, a contractor and a game production company. This option is dissuaded from, because it involves high labour costs.

**Figure 3. Screen capture of the virtual environment.**