3D Interactive Interface for University of Twente campus

Marijn Kruizinga, Industrial Design Engineering, University of Twente, Netherlands

Topic: Designing a 3D Interactive Interface concepts and developing a 3D Interactive Interface prototype for the University of Twente campus.

Background information:
This assignment was conducted internally at the University of Twente. Research into this topic was seen as beneficial for the research groups on campus, for example within DPM, and as beneficial for building management organizations like CFM.

In recent years, universities worldwide have been increasingly focused on improving campus management and sustainability by using advanced technologies and data analytics. By structuring their data, universities aim to reduce unnecessary energy losses from campus buildings, their infrastructure, and amenities by using this data for practical decision-making. The current more commonly used methods of data structuring, such as spreadsheets and static charts, often fall short in visualising the multi-dimensional and ever-changing data used for campus operations. A 3D interactive interface offers a powerful solution and will enable the stakeholders to explore this data in a spatial context that closely resembles the real-world environment.

Therefore, the main research question of this thesis is to find out what the optimal design is for a 3D interactive interface that will be used to visualise data on buildings and people at the University of Twente and is aimed at improving the specific stakeholders' understanding of energy, space, and time efficiency to aid them with decision-making.

To create such an interface, a comprehensive understanding of key concepts like real-time data, UI & UX, and 3D interactive interfaces is vital. Research into these concepts provided guidelines, considerations and principles that were made practical and used for the design of the actual interface. Furthermore, tools like stakeholder interviews and literature research led to the development of structured requirements to which the 3D interactive interface would need to adhere. These requirements have been used both during and at the end of the designing process to conclude that the concept and prototype continuously adhere to these requirements. Furthermore, looking into existing solutions and analysing the key concepts resulted in a solid foundation of common practices upon which the design has been built.

Results and limitations:

The results of this assignment are a 3D interactive interface concept and prototype. The concept successfully visualizes energy, time, and space related data. Its key features include problem notification & solving, space allocation by use of the university's room booking system, confidentiality through different accessibility levels, comparison and visualization of energy data, and a building specific analysis tool with which data is visualized on different scales. The interface and its features can be seen in Figure 1. Additionally, interaction with the interface has been visualized by use of a flow diagram that can be seen in Figure 2, of which a readable version can be found in the thesis report.

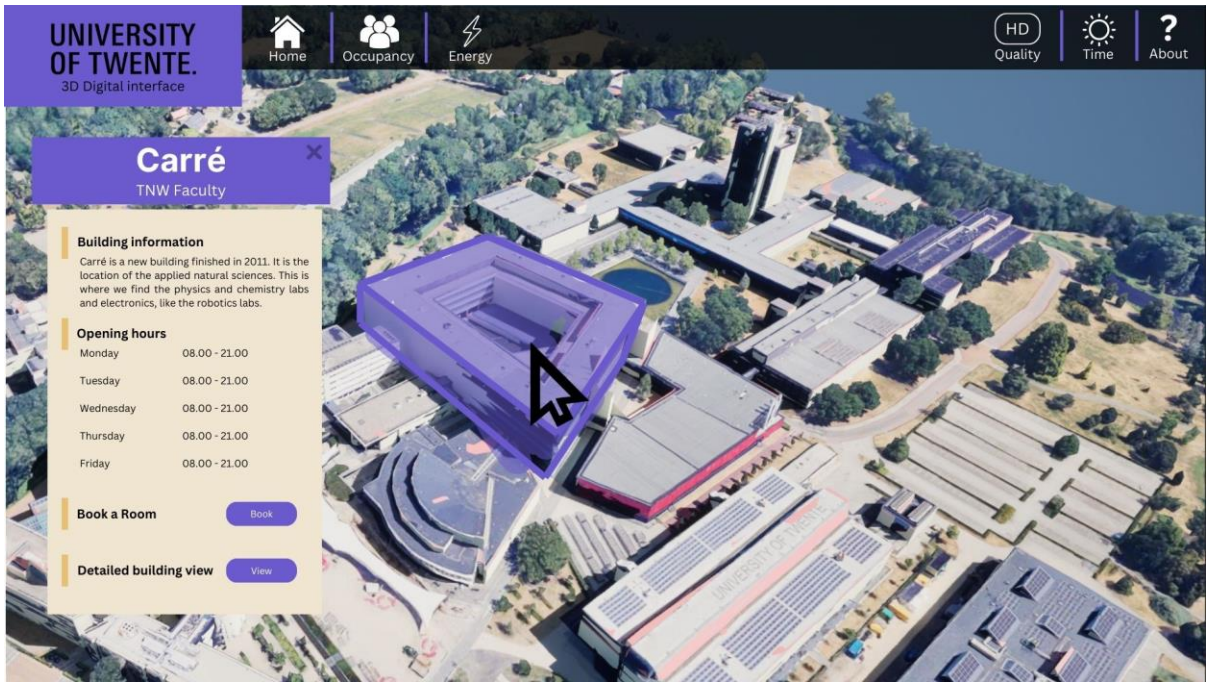

Figure 1: Home page of the interface after building interaction.

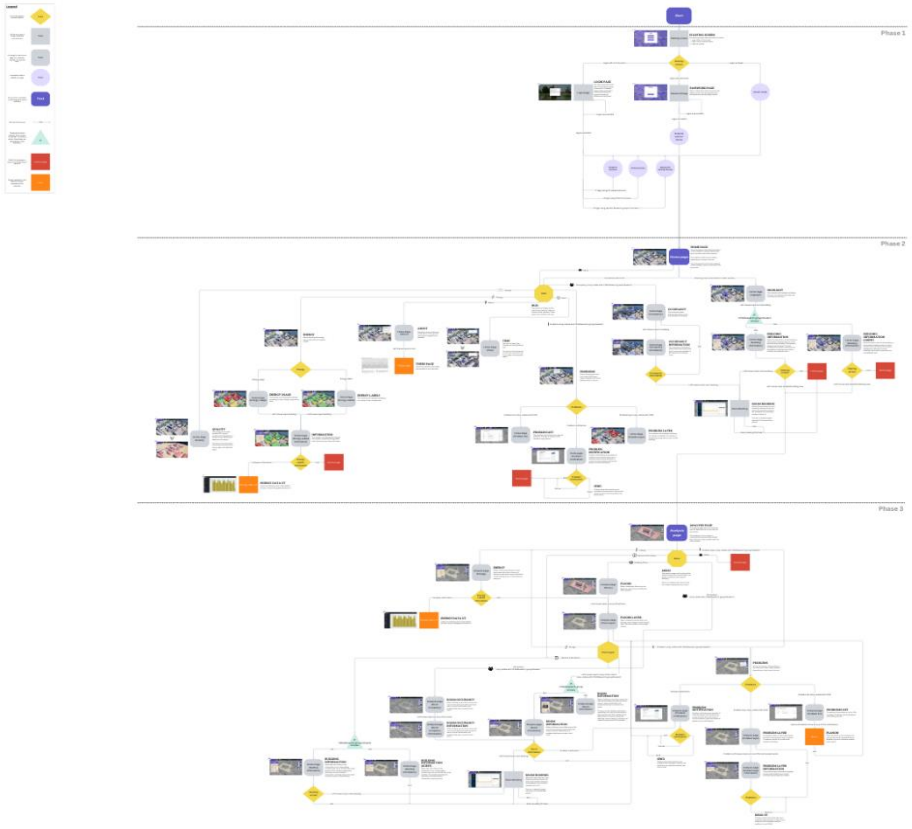

Figure 2: Complete flow diagram overview

Although this concept technically fulfills all requirements, it does have its limitations and shortcomings. For example, it does not give the user suggestions for practical ways in which the data could be used, this task is still up for the user to do.

The prototype is developed and used for testing, demonstration, and to provide a foundation on top of which the actual interface can be built. The prototype contains limited functionality compared to the concept. It can display building information, highlights and use the building specific analysis tool for surface level data visualization. The prototype can be seen in Figure 3, and its testing function can be seen in Figure 4. The prototype is still limited in demonstrating the complete user experience as described by the concept, therefore further development is needed to realize a working 3D interactive interface.

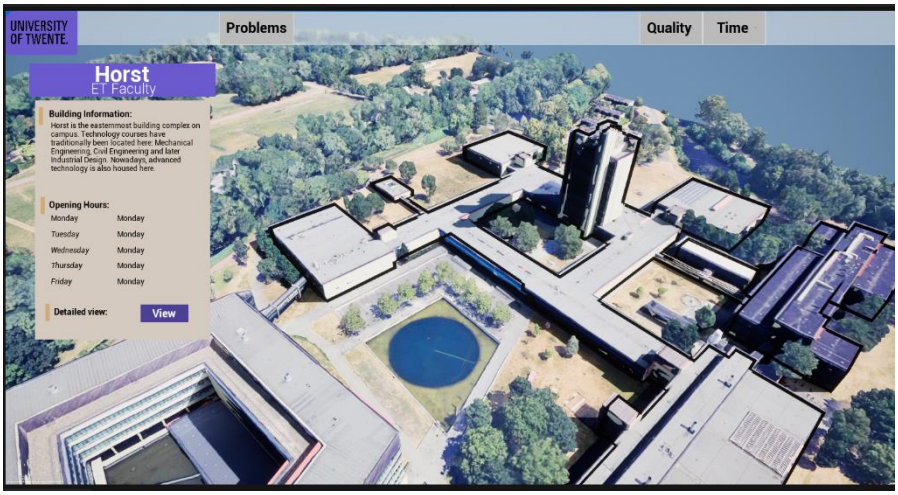

Figure 3: The prototype showcasing building information.

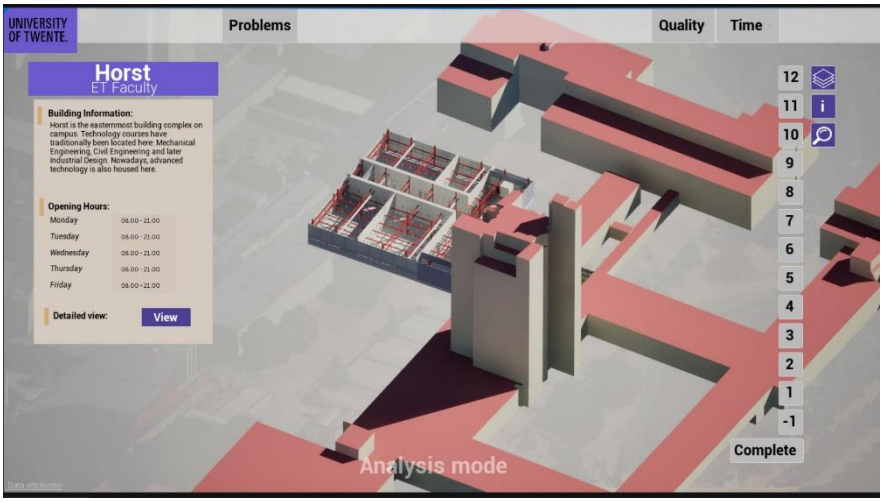

Figure 4: Testing an experimental detailed view feature.

Conclusions and recommendations:

The results of this assignment did answer the research question by providing an exact description of the most optimal 3D interactive interface design through extensive research and stakeholder interviews. Additionally, conveying the essence of the working interface has been made possible by showcasing the prototype. Potential improvements would be to make the protype match the functionalities of the concepts. This will aid with demonstration and testability of the concept. Specific activities that could be utilized for further development would include more extensive and broad stakeholder interviews and iterative stakeholder testing. Following these recommendations will ensure that the 3D interactive interface will become a valuable tool for data-driven decision-making at the University of Twente.