Design Guidelines for Mobile Augmented Reality Reconstruction

by **Peilun Yuan**

The thesis research attempted to propose 6 design guidelines for mobile augmented reality (AR) reconsturciton. The guidelines were created by summarizing the related researches. After that, an evaluation was conducted at Prinzessturm to explore the effectiveness of the guidelines. The guidelines could provide a design reference for the developers and help them in the early stage of develpment.

Fig.1 The panorama view of the ruins of Prinzessturm

Background

Through AR, visitors can perceive the reconstruction of the disappeared heritages as if they were rebuilt at the same sites. With the introduction of high-performance mobile devices, AR is getting more popular and prevailed [1].

Most of the AR researches focused on solving technical problems and lacked the studies about AR design. Some researchers have noticed the issue and developed some AR design principles [2]. However, none of them is especially for AR reconstruction. Considering the special needs for AR reconstruction, the studies of the design guidelines are necessary.

AR Reconstruction

AR reconstruction is a kind of AR applications that emphasizes on presenting the disappeared heritages. AR is a more intuitive method to perceive environments in comparison with non-AR method. Other than digital preservation, the purpose of AR reconstruction is to show the relation between the heritages and their surroundings and even raise broader public awareness and apprecitation [3]. For the technical parts, AR tracking is the important technique for AR reconstruction. It detects certain targets and makes the object position at the correct place. Besides, the applications usually involve tagible interface where the users can interact with the objects by on-screen gestures.

Design Guidelines

Six guidelines were developed after identifying the features of AR reconstruction and summarizing other existing AR design principles and appliacations for AR reconstruction. The guidelines are as below.

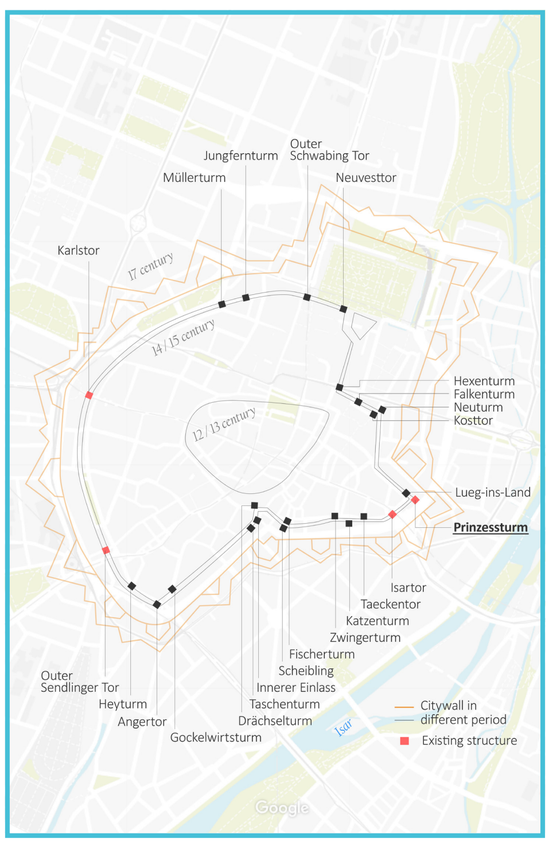

Fig.2 The location of Prinzessturm and the relation to the city wall

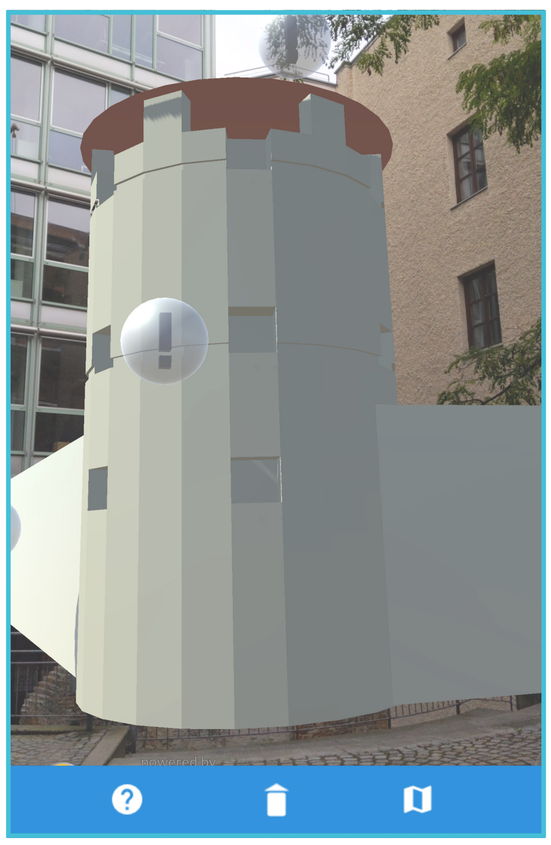

Fig.3 The AR view of Prinzessturm

1. **Suitable tracking method**: using suitable tracking to achieve high accuracy, responsiveness, and low latency
2. **Quality 3D models**: making the balance between user experience and hardware performance
3. **AR interaction versus non-interaction**: exploring or to presenting purpose
4. **Storytelling**: designing and presenting appealing stories to interest the public
5. **Provide user guide and feedback**
6. **Prevent cognition overload**

Evaluation

A prototype was made to explore the effectivenss of the guidelines. The site is at the ruins of Prinzessturm, a medieval tower in Munich. When the mobile camera detects the ruin, the model can appear immediately. There is a toolbar with 3 icons at the interface. The icons provide the user guide, the story of Prinzessturm, and the map which shows the location of Prinzessturm and other old city structure. Information boxes are deisgned for the users to interact with the objects. By clicking the boxes, they can see more informations and the highlighted color of the objects.

Most of the evaluation participants held positive attitudes to AR reconstruction and felt satisfied about the AR experience. The results showed that the guidelines can enhance users' understanding to the heritages.

Conclusion

This is one of the first resesarches about the guidelines of AR reconstruction. Further researches are needed for examining the effectiveness of each guidelines and the integration with more interaction which can make learning through plays.

Thesis Conducted at

Chair of Cartography
Department of Civil, Geo and Environmental Engineering
Technische Universität München

Technische Universität München

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Year

2019

Keywords

Mobile augmented reality, AR design guideline, cultural heritage, digital heritage

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This master thesis was created within the Cartography M.Sc. programme – proudly co-funded by the Erasmus+ Programme of the European Union.

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