

# Map-based Storytelling in Spatial Augmented Reality: Projection of Interactive Layers



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**Mixed reality technologies are already widely used in the Cultural Heritage field, especially in museums to make the exhibition more entertaining and enjoyable for the visitors. There are currently no conceptual and technical solutions to put a paper map in such a mixed reality environment to tell a story in a museum. Additionally, there is no research investigating if building an interactive environment around the cartographic piece of art could be useful for cultural heritage interpretation.**

**This study investigates how a paper map can be projected and enhanced with interactive layers in such an environment, called Spatial Augmented Reality (AR). Furthermore evaluates the impact of this method in the user experience.**



Fig.1 User exploring AR exhibition prototype

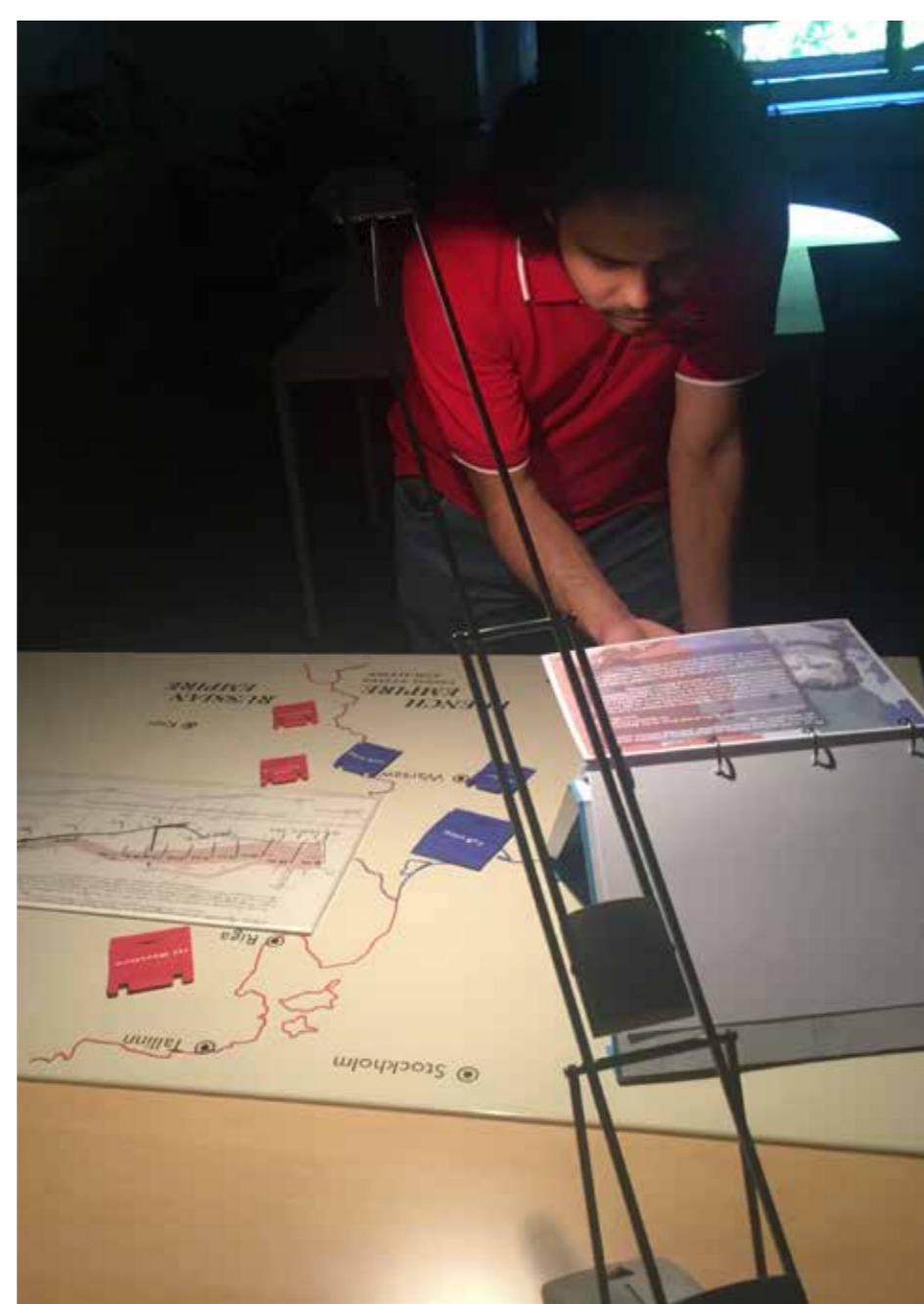


Fig.2 User exploring Classical exhibition prototype

## Context

Digital technologies are transforming all kinds of museums into hybrid and complex spaces, where the virtual lives of characters and stories are blended with the physical form of artefacts [1].

The design of museum exhibitions and museum experience often uses the storytelling method. Within this method, the visitor is guided through the story, using museum pieces in the interactive and non-interactive exhibit environment. It could create a more comprehensive experience, increase engagement and improve the emotional response [2].

One technology that is widely used in the Cultural Heritage (CH) field is Mixed Reality (MR). Some of MR solutions are enhancing original historical objects or their replicas by putting them into the interactive virtual environment. It helps to overcome traditional limitations like time, space and non-interactivity [3].

The usage of such MR technologies for

telling stories via maps could enhance visitors experience, the quality and the quantity of the acquired knowledge further.

## AR and Classical exhibitions prototypes. Evaluation.

In a first step, the hardware and software technology suitable for the realization of an example exhibition was investigated and finally selected. The way of user interactions in the AR space were defined, as well as types of connected media that could be integrated in the exhibition were explored.

Two prototypes have been built using the example of the map of Charles Minard about the Napoleon's Russian campaign. One prototype placed the map in a Spatial AR environment (fig. 1), the other one presented the map in a classical exhibition example (fig. 2).

A prototype of an AR exhibition was developed within this thesis using the proposed

method. The main user interface element integrated is a timeline. Media types that were used are maps, text, graphics and sound background.

The classical exhibition is telling the same story, with the same content, but no digital technologies were used.

Finally, both exhibitions have been evaluated by 25 exhibition visitors within a comparative study. The test user group were divided into two equal parts: one was work with AR exhibition; another was working with Classical exhibition. Users have been asked to solve various tasks and comment on their experience.

## Conclusion and Outlook

The results show that the visitors liked both exhibition samples with a slightly better result of the Spatial AR realization in terms of task solving (fig. 3).

Additionally, the users confirmed that using paper maps in such an environment makes the exhibition more entertaining and is enhancing the potential museums visitor experience.

Interactive map overlays, overview maps, a timeline and infographics have been identified as the most effective elements in Map-Based Storytelling in a Spatial AR environment and could be recommended for the priority usage in similar exhibitions.

In future studies, maps of different topics, scales and geography should be used as a core of storytelling. The user group participating in the experiment was limited in terms of age and mostly came from the cartography field. It is recommended to expand the user test and include more users with different background and age in future.

The comparison between the AR and the classical approach could be supplemented with on screen solutions.

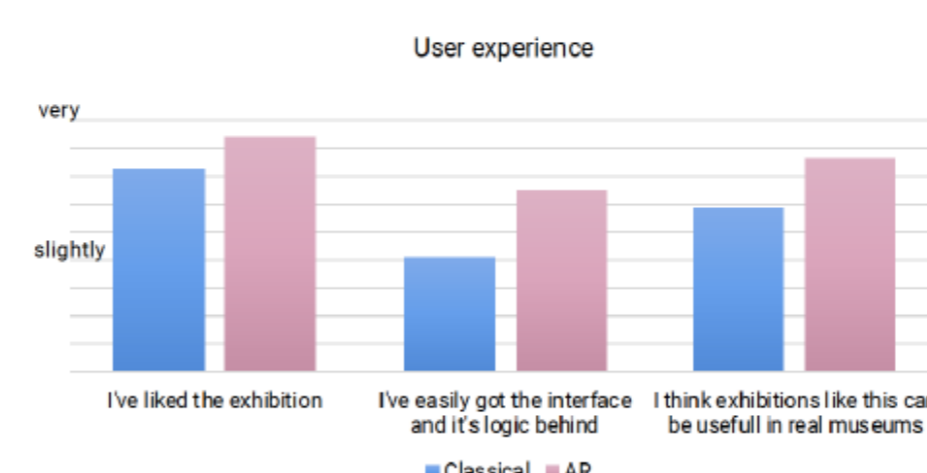


Fig.3 User experience evaluation results

## Thesis Conducted at

Chair of Cartography  
Department of Aerospace and  
Geodesy  
Technische Universität München



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## Year

2020

## Keywords

Projection mapping, Mixed Reality, Storytelling, Historical maps

## References

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