Toward VR eventscapes for spatio-temporal access to digital maritime heritage

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This abstract sketches the basic design of a prototype that enables the proper display, exploration, and analysis of historical shipping data in an adaptable WebVR environment. In the environment users will be able to create visually networked 'eventscapes' which allow to identify spatio-temporal patterns in digitized maritime heritage and similar datasets.

Keywords—Virtual Reality, Maps, GIS, WebVR, Digital Maritime Heritage

I. Introduction

Over the last two decades, archives, libraries, and publishing houses all over the world have spent major efforts to digitize and disclose historical shipping data and other data from the age of Sail. However, interacting with such datasets from a space-time perspective is challenging. Owing to the heterogeneity of data (e.g. different spellings of place names, large number of variables, incompleteness), cartographers struggle to provide users with visual representations that allow fast and appropriate access to maritime heritage GIS data on a single screen. In particular with larger datasets, visual clutter in 2D visualizations obstructs the identification and analysis of spatio-temporal patterns [1].

To work toward a solution we develop an open source adaptable virtual reality (VR) environment which enables users to create visually networked 'eventscapes'. Similar to 2D dashboards, our VR environment allows users to detect and contextualize spatio-temporal patterns in the form of digital maps and linked timelines (= an eventscape). Our use case is a data set about ships, crew members and cargo from the so-called 'interrogations' of the Prize Paper archives [2].

II. Challenges of Digitized Maritime Heritage

Our use case forms part of the digitized Prize Paper archive, a vast and valuable collection of judicial documents, private and official letters, shipping lists, and ledgers covering the period between 1652-1815. Up to now, no attempts have been made to explore the richness of this enormous data set by means of spatio-temporal visualization in a VR environment. The 'interrogations' provide valuable insights in the global movement of humans and cargo and the maritime labor market in the early modern world. To open up and prepare this digital collection for further analysis, our VR environment will function as intermediary between data from the 'interrogations' and the users.

III. Toward a Prototype

In comparison to traditional representation environments on a single screen, VR offers a seemingly unlimited space which can be used for data representation through interaction with the data. Our immersive VR environment allows users to uncover spatio-temporal patterns in digitized maritime heritage which allow to contextualize, confirm or reject prior hypotheses.

WebVR is a web specification that enables Virtual Reality in a browser. WebVR is not commonly used in the geo-domain because the common frameworks, like A-Frame, to create WebVR environments lack the ability to display maps and geo data with web technology. In order to bring this capabilities to WebVR we created an A-Frame component for OpenLayers which makes it possible to import any OpenLayers map into an A-Frame WebVR environment. This allows us to add geo and map capabilities inside WebVR using standard web technology which was core to our experiments with the Prize Papers dataset (see figures below).

Our prototype enables the proper display, exploration and analysis of the Prize Paper interrogations in a WebVR environment, and provides summaries of information in several linked graphical representations. A flow map shows, for instance, the spatial component of the movements. A timeline illustrates the temporal distribution of involved movements, while a bar chart displays the frequency of movements. In addition to graphical representations, filters and highlighters will be implemented in the VR environment interface. In order to avoid that users are confronted with an information overload in the VR environment, users regularly test the prototype.

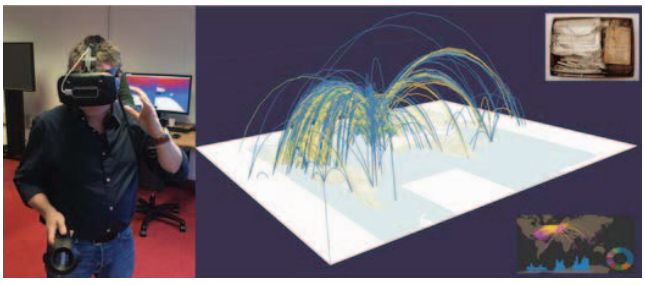

Fig. 1. Prototype testing in VR laboratory ITC Faculty University of Twente.

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IV. Conclusion

The suggested adaptable virtual reality (VR) environment has several advantages compared to single screen dashboard representations. First of all, there is almost unlimited 'space' to create linked views all around users. It enables users to create visually networked 'eventscapes'. Second, the effect of the immersive three-dimensional environment allows the use of alternative graphic representations with the potential to un-clutter the shipping data, resulting in a better understanding of the 'interrogations' and similar large datasets. The WebVR solution creates access from all browser enabled devices. However, specific usability experiments have to be carried out to empirically evaluate whether the advantages mentioned above are generalizable.

Fig. 2. View of VR environment built for the interrogations of the Prize papers and similar large datasets.

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