

# Time machines for Online Services: An Evaluation of a New Interface to Visualize Knowledge Over Time

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## Introduction

- Tools to visualize knowledge and facts stored in repositories online use text structures, taxonomies, and image to represent the data organization to human beings.
- Appropriate interfaces could help users to compare data over time, navigate through time easily, find references within the past and make inferences about the future.
- The interface becomes a time machine, a structure that improves the representation of the knowledge.
- New tools to navigate over time have been proposed in the literature.
- In a recent paper, we have introduced a 3-dimensional interface (Di Matteo & Blustein, 2018) that is inspired by technologies used to visualize and study trajectories of atomic particles (Wolter et al., 2009), and NASDAQ data (Kenny & Becker, 2015).
- Users could have the sense of the evolution in time of physical structures, paths, and entities, such as changes in cities and population.

## Research proposal

- An evaluation of the usability and the efficiency of the proposed interface to navigate over time
- A method to compare the interface proposed with those that are the most used in online services using elements such as tables, and slides and buttons
- A high fidelity prototype of the interface to navigate the content extracted from the Europeana digital platform (*Europeana Pro. History*, n.d.) is suggested

## Proposed Research Methodology

- Informal research questions such as
  - "Can the user describes facts happened in the past after having only used the interface?"
  - "Is a fact positioned in the past reachable in less time than using traditional solutions?"
  - "Are the functionalities of the interfaces easy to use?"
- A high fidelity prototype
- Usability, efficiency, and satisfaction of the users will be determined using methods of the User-centered design process
- The experiment should point out that the usability of the interface is different from the others considered

## Building the Prototype

- It will visualize data from a vast archive online such as Europeana (*Europeana Collection*, n.d.).
- Europeana gives the access to contents of museums, galleries and audiovisual archives.
- The interface will give a visualization to navigate over time associated elements of interest.
- Starting from 2-dimensional objects such as maps (*Europeana Maps*, n.d.) available on Europeana, a representation of the places in 3D can be created.
- Europeana offers several APIs to access its objects (*Virtuoso SPARQL Editor*, n.d.; *Europeana SPARQL API*, n.d.).
- The high fidelity prototype will present only some fictitious contents and features.

## Methods to Gather Usability, Efficiency and User Satisfaction

- Structured and contextual interviews in different sessions
- Contextual inquiry to observe how the users interact with the interface
- Questions for an initial exploration of the behaviors of the users, gathering the interesting features, measuring the satisfaction
- Participants should be randomly chosen
- Open questions could be added to gather opinions and reaction in more details

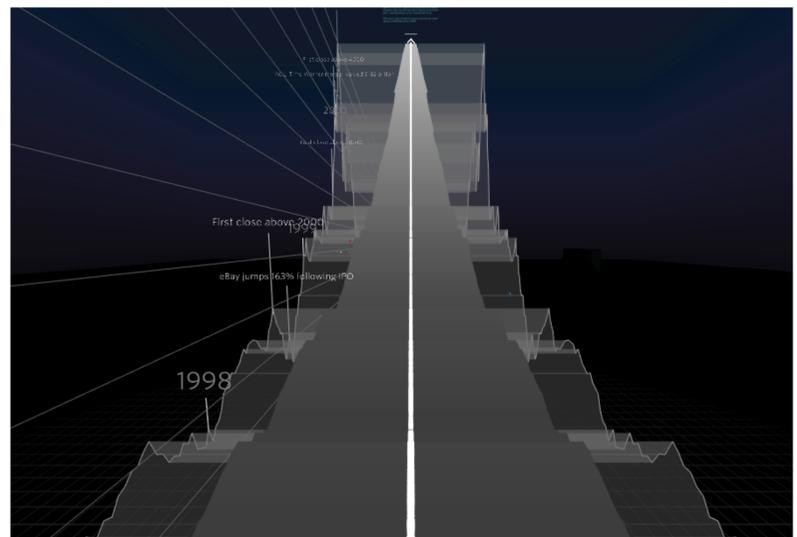


Figure: A virtual reality guided tour of 21 years of the NASDAQ (Kenny & Becker, 2015)

## Analysis of the Study Design

- Research questions are particularly difficult to answer because they involve the use of features that are complex.
- Use cases to test for the most salient parts of the interface
- Unconscious behaviors can be gathered observing how the participants use the prototype with contextual inquiries.
- Results could be compared between groups using statistical models.

## References

- Di Matteo, N. R., & Blustein, J. (2018). Navigating data over time: Including the fourth dimension in visualizing knowledge. In *Proceedings of the 1st workshop on human factors in hypertext* (pp. 5–8). doi: 10.1145/3215611.3215614
- Europeana collection*. (n.d.). Europeana Foundation.
- Europeana maps*. (n.d.). Europeana Foundation.
- Europeana pro. history*. (n.d.). Europeana Foundation.
- Europeana sparql api*. (n.d.). Europeana Foundation.
- Kenny, R., & Becker, A. A. (2015). Is the NASDAQ in another bubble. *A virtual reality guided tour of 21 years of the Nasdaq*.
- Virtuoso sparql editor*. (n.d.). Europeana Foundation.
- Wolter, M., Hentschel, B., Tedjo-Palczynski, I., & Kuhlen, T. (2009). A direct manipulation interface for time navigation in scientific visualizations. In *3dUI* (pp. 11–18). doi: 10.1109/3DUI.2009.4811199