Towards Discovering Meaningful Historical Relationships in Virtual Reality
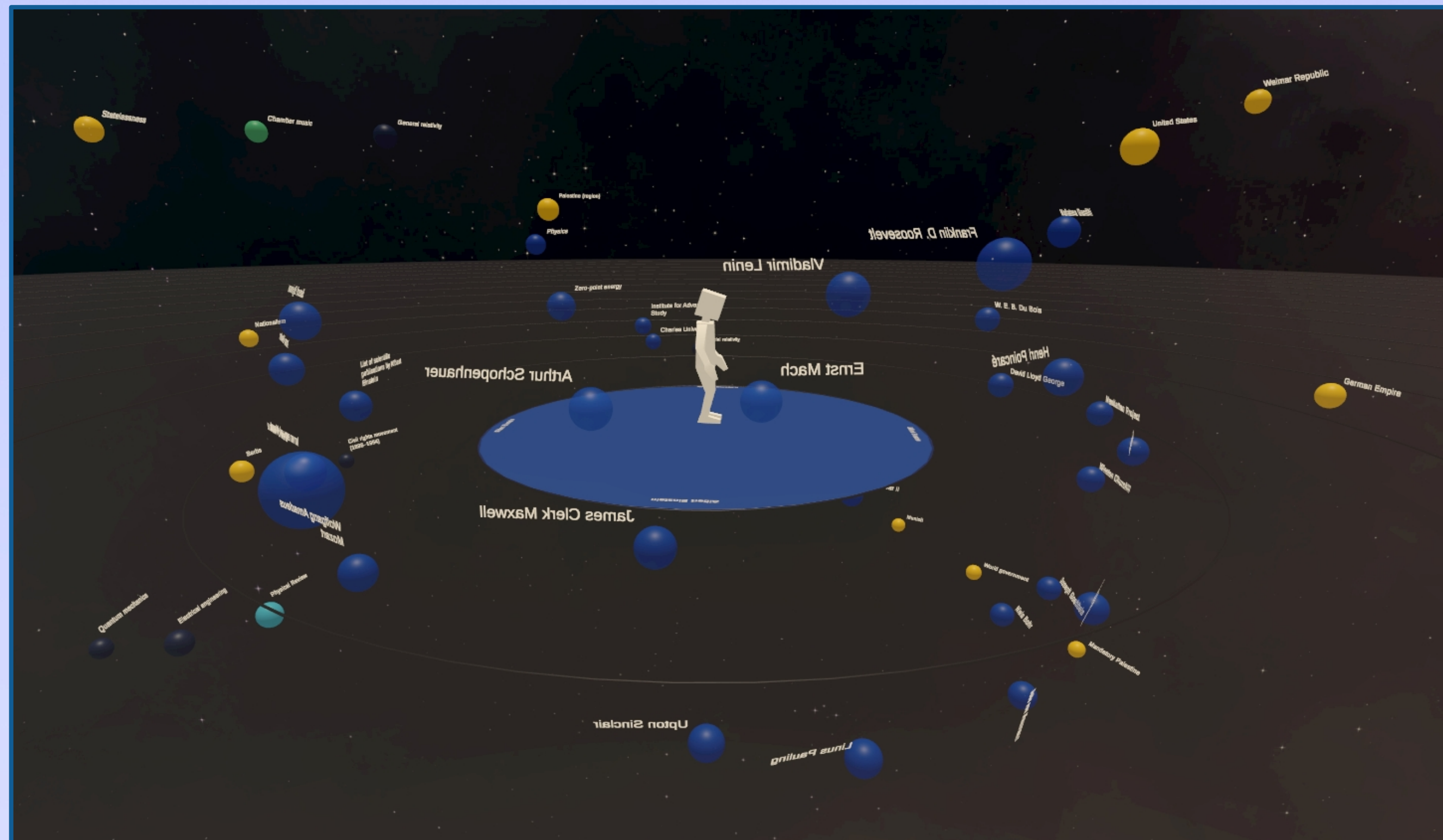
Figure 1: Fragments are represented as colored and labeled spheres floating in space. They are arranged in a meaningful way to represent interrelationships between fragments.

Figure 2: The user can explore the scene from an egocentric viewpoint using a head-mounted display. By modifying the components' weights the user can change the fragments' arrangement.

1. Motivation

- Exploring historical relationships requires the analysis of different sources, which are often difficult to interpret without specialized domain knowledge

- Traditional visualization tools mostly rely on conventional 2D visualizations

2. Our Approach

- Creation of a novel interactive exploration tool for historical data in VR

- Historical fragments are arranged in a 3D environment based on their temporal, spatial and categorical proximity to a reference fragment (see Fig. 1)

- Two distance measures determine the position of each fragment (see Fig. 2)

- One distance measure serves as an input metric for the UMAP algorithm [1].
  UMAP finds an appropriate arrangement of the fragments on a spherical shell around the user

- The second measure affects the distance of the related fragments to the center. This distance determines the radius of the spherical shell

3. Expert Opinions

"The third dimension is very exciting, useful and helpful, because more information can be encoded than in 2D representations."

"The handling of the hardware as well as the initial effort in learning the interpretation of the visualization should not be under-estimated. Here a standardized tutorial makes sense, in which all features are explained clearly such that the tool can be learned without the help of a professional instructor."

"Interacting with the application was very complex initially, but I think the system would be fast to learn during repeated usage."

"It would be nice if one could see the relationship between two fragments in exact numbers."

"The current version of the system offers little functionalities for interacting with the data beyond basic parameter adjustments and jumping between fragments."

4. Future Work

- Development of more advanced features for interacting with the data

- Formal usability studies involving diverse samples in terms of age, gender, and background
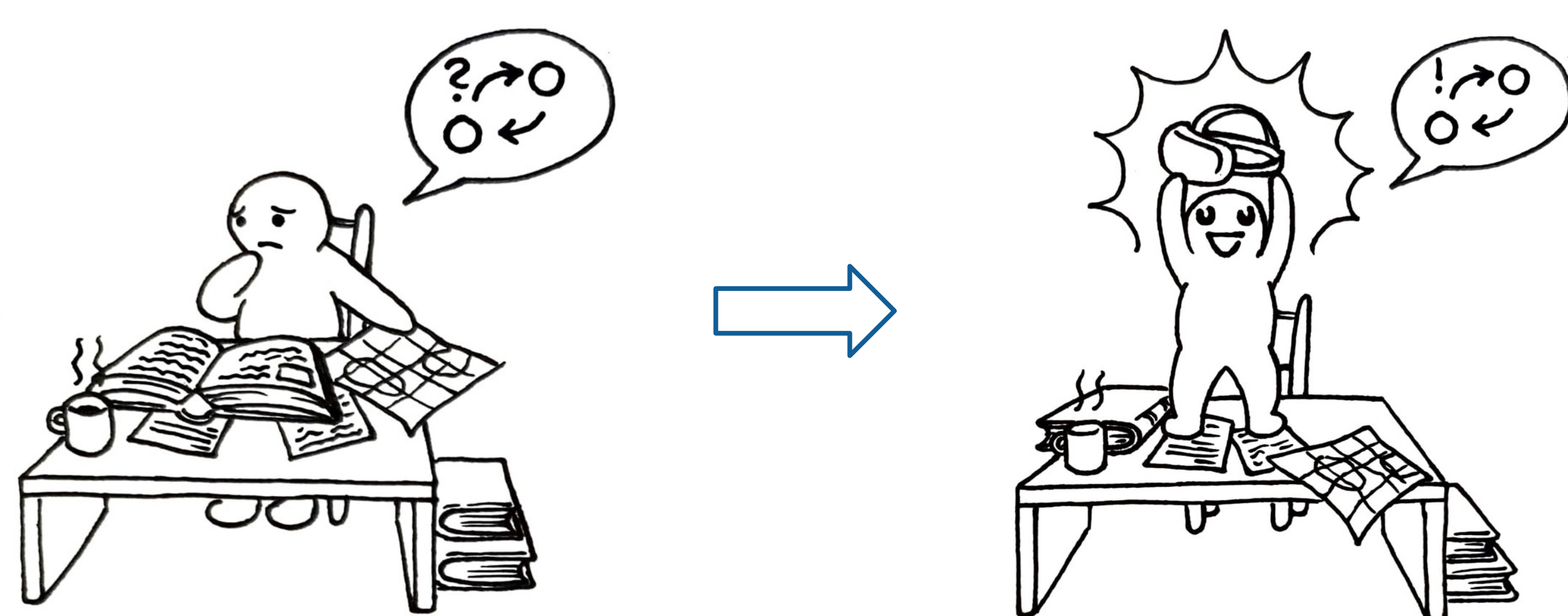
References

[1] L. McInnes, J. Healy, and J. Melville. UMAP: Uniform Manifold Approximation and Projection for Dimension Reduction, 2018. doi: 10.48550/ARXIV.1802.03426

Melanie Derksen[1], Tim Weissker[2], Torsten Kuhlen[2], Mario Botsch[1]
[1]TU Dortmund University, [2]RWTH Aachen University, Contact: melanie.derksen@tu-dortmund.de

tu dortmund university
RWTH AACHEN UNIVERSITY

ID: #1069

IEEE · IEEE COMPUTER SOCIETY · vgtc