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How do visitors explore a virtual museum in XR? Behavioral profiles from an in-person study



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Introduction and Research Question

Why do we study exploration in Virtual Museums?

Virtual museums offer new ways to explore cultural content through Extended Reality (XR) technologies.

Visitors may differ in terms of:

- The way they move through the virtual space.
- Their head movements and focus of attention.
- The time they spend on exhibits and their accompanying information.

Previous research has investigated patterns in museum visitors' behavior [1].

Research question

Can movement, attention, and interaction data reveal different patterns of visitor behavior in a Virtual Museum deployed in XR?

VR Application and Participants

The MusePlore Virtual Museum

- This study was based on the MusePlore application [2].
- MusePlore was adapted to an XR environment using Unity and OpenXR.
- The Meta Quest Pro headset was used.



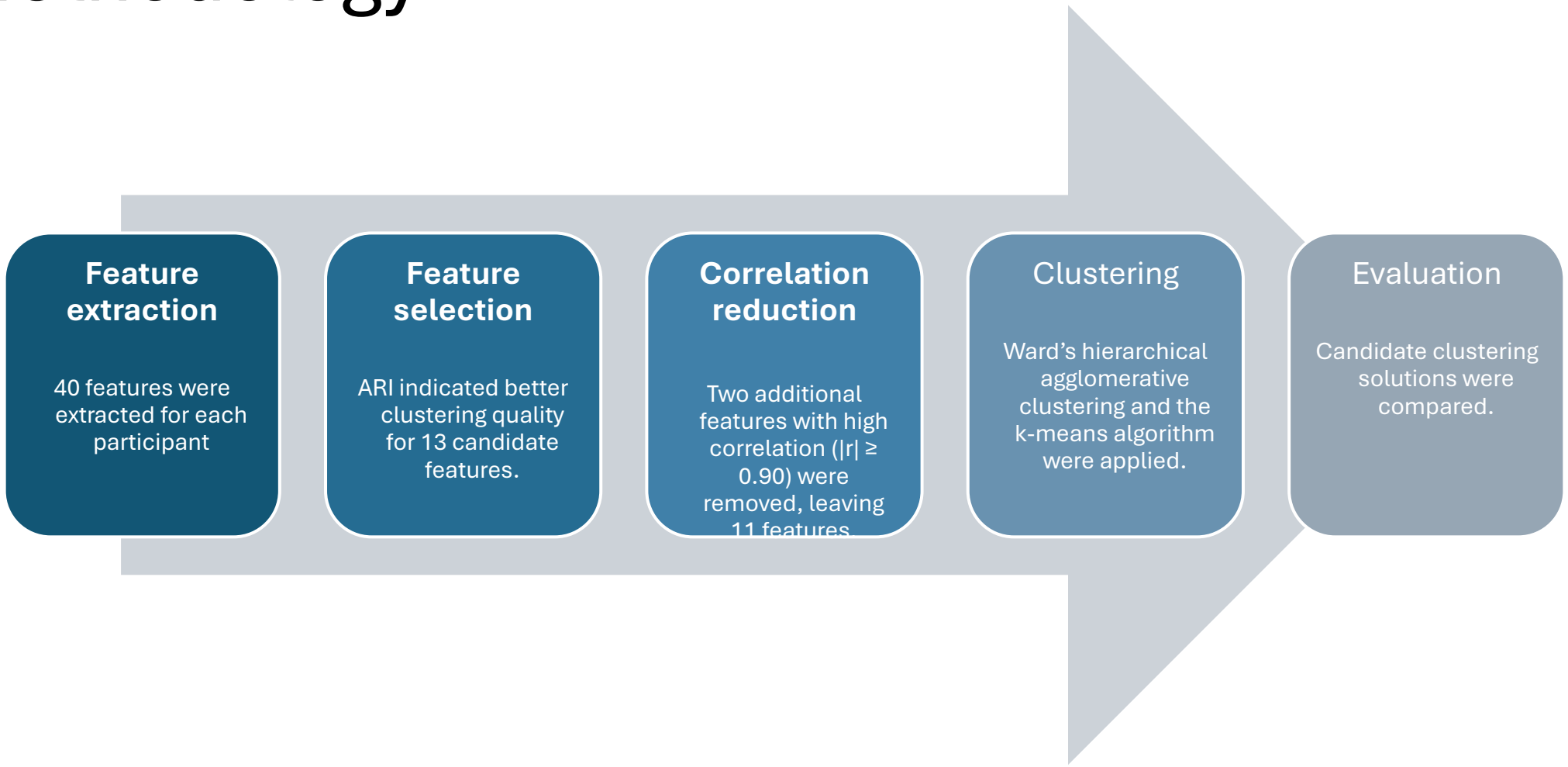
Study and participants

- In-person study with 46 participants.
- Free navigation within the museum.
- Navigation, movement, and interaction data were recorded.



Objective: To record and analyze visitors' behavior during their exploration within the virtual museum.

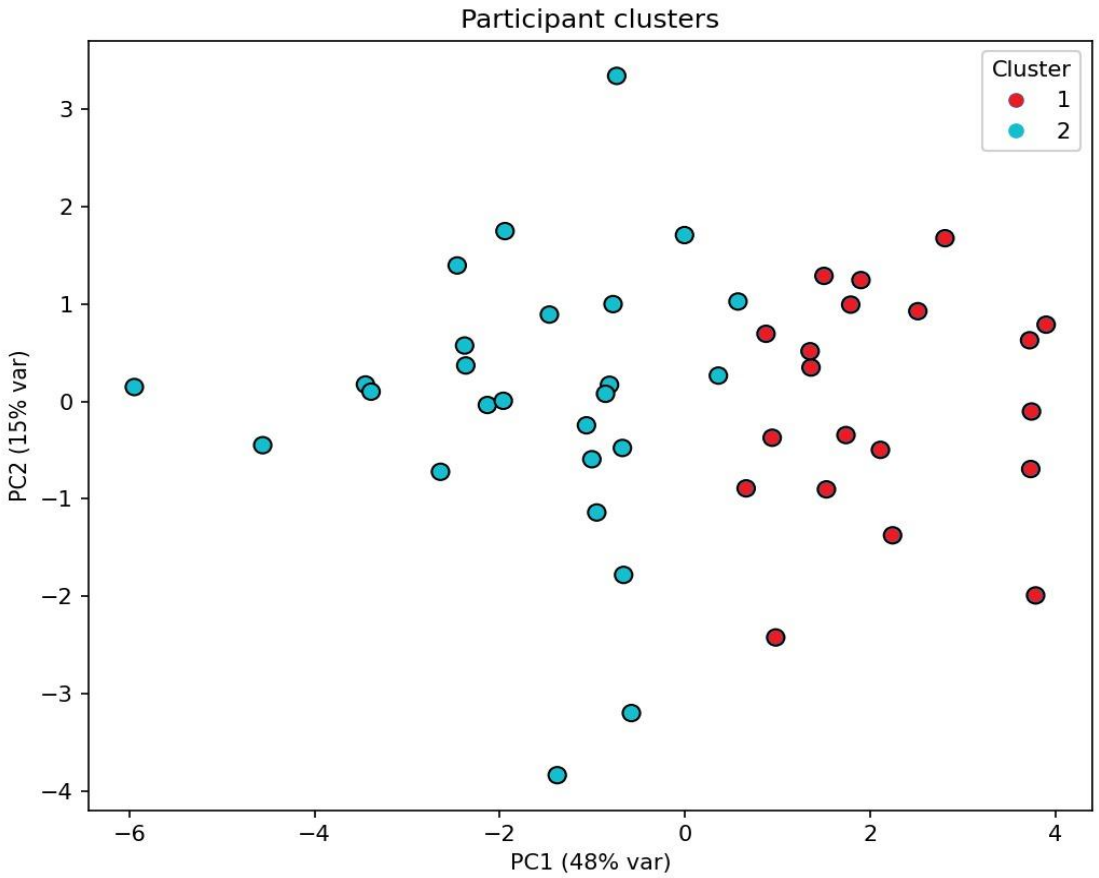
Methodology



Results

Two behavioral patterns

1. **Thorough Visitors (n = 20)**
   - Lower movement speed
   - Higher percentage of time spent stationary
   - Longer average dwell time at exhibits
   - More time spent viewing exhibit information
   - Higher engagement efficiency
2. **Efficient Explorers (n = 26)**
   - Higher movement speed
   - Greater speed variability
   - Lower percentage of time spent stationary
   - Higher head rotation rate
   - Less time spent viewing exhibit information



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Findings

- The combined analysis of movement, attention, and interaction can reveal different exploration patterns in an XR virtual museum.
- Two distinct behavioral patterns were identified in the sample of 46 participants.
- The findings can serve as a basis for further research and for designing more flexible experiences in virtual museums.
- Further validation is required before these behavioral patterns can be used to personalize visitor experiences.

Implications and Future Research

Implications

- Adapting navigation guidance to visitors' needs.
- Offering different ways of presenting exhibit information.
- Designing experiences that support different exploration styles.

Future research

- Testing the behavioral patterns on a larger and more diverse sample.
- Investigating visitor behavior around specific exhibits.
- Assessing the reproducibility of the results across different museums and devices.

References

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2. Panos, F., Raptis, G. E., Katsini, C., & Katsanos, C. (2024, June 27). Towards identifying visitor types in virtual museums using spatial and interaction data. Adjunct Proceedings of the 32nd ACM Conference on User Modeling, Adaptation and Personalization, 505–509. Presented at the UMAP '24: 32nd ACM Conference on User Modeling, Adaptation and Personalization, Cagliari, Italy. doi:10.1145/3631700.3664908