



Leveraging Augmented Reality to Preserve Community History

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Abstract

As gentrification continues to rapidly transform many communities, the intangible heritage of a community's memories and lived experiences are at risk of being lost, leading to the gradual erosion of a community's history and cultural heritage. In this context, Augmented Reality (AR) has emerged as a powerful medium for integrating physical and digital realms, offering novel possibilities for preserving community history. By overlaying historical content onto physical spaces, AR allows users to interact with the past as they navigate their present environments, helping bridge the gap between history and the current lived experience. This research details a case study focused on Harlem, New York, where we employed a user-centric design approach to prototype *Community AR*, an interactive AR platform designed to preserve a building's story. We concluded by conducting a pilot study and usability testing with members of the Harlem community, through which we gained key insight into AR's potential to mitigate the loss of history in the face of urbanization.

Research Questions

1. How can AR be effectively utilized to preserve community history?
2. What are the key UI/UX design considerations for developing a community-centered AR application?

Methods

Formative Study

User research, field studies, focus groups, literature review, archival research & diary studies in partnership with NSF CS3.

Prototyping

Design low-fidelity wireframes by hand & on Balsamiq.
Design high-fidelity wireframes on Adobe Illustrator, Figma, Procreate & Sketch.
Create 3D models of historical buildings on Blender.

App Development

Develop interactive prototypes of beta mobile application & AR features on Unity.

Usability Testing & Pilot Study

Gather preliminary feedback to inform future iterations.

Data Analysis

Implement quantitative & qualitative techniques to analyze results.

System

Figure 1.1

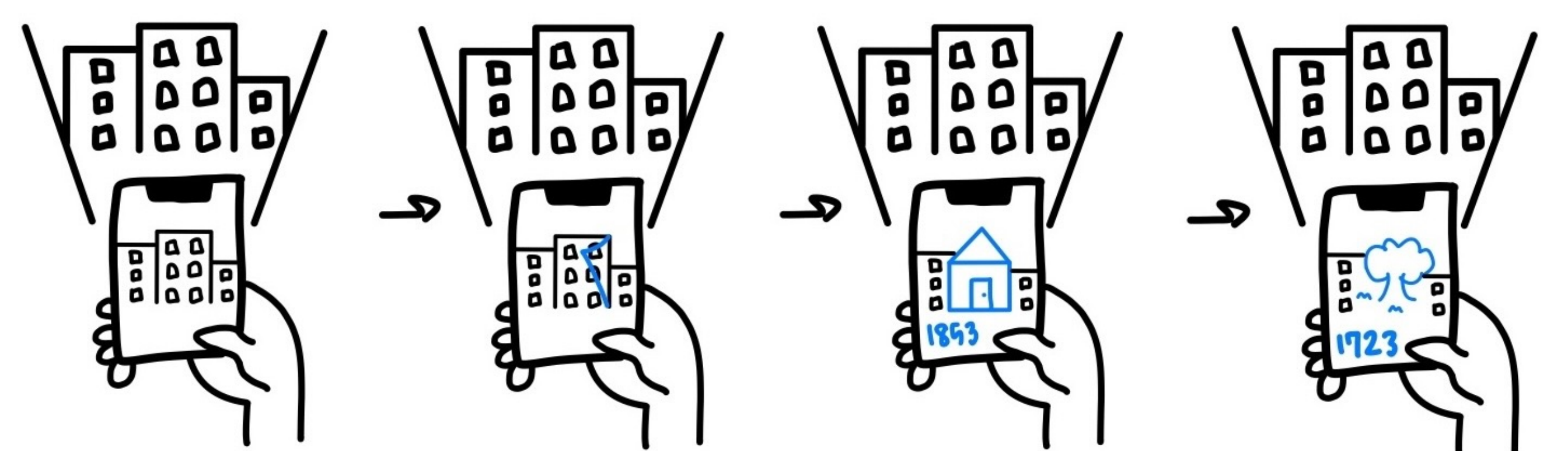


Figure 1.2

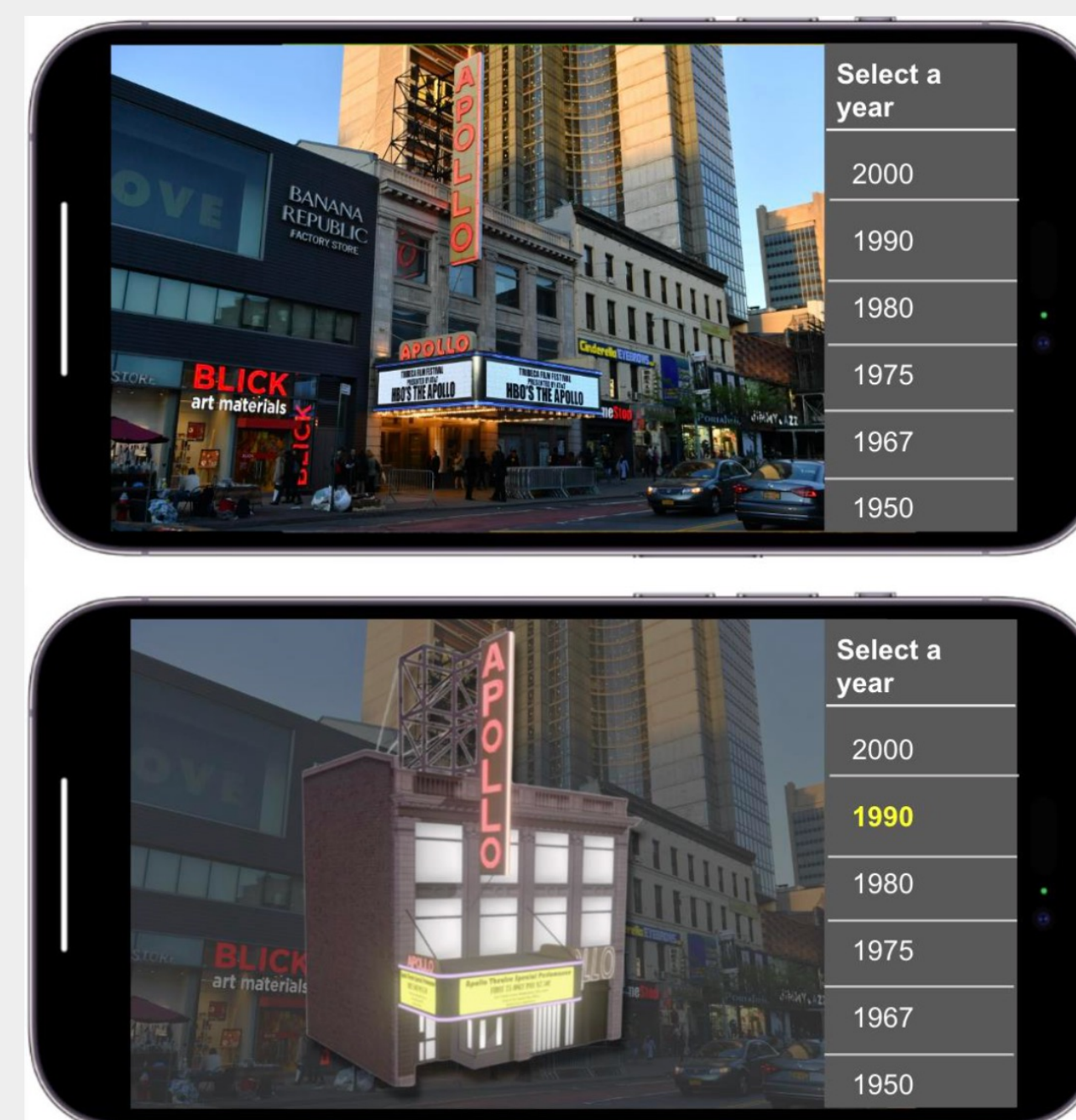


Figure 1.3

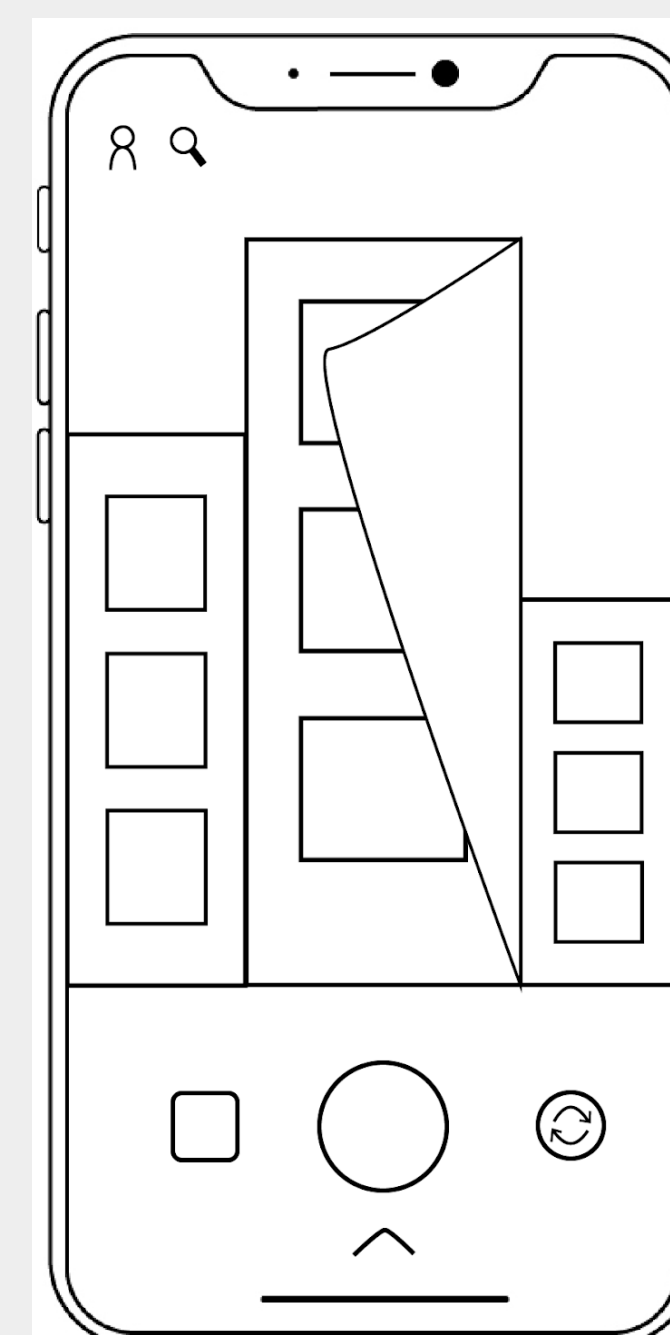
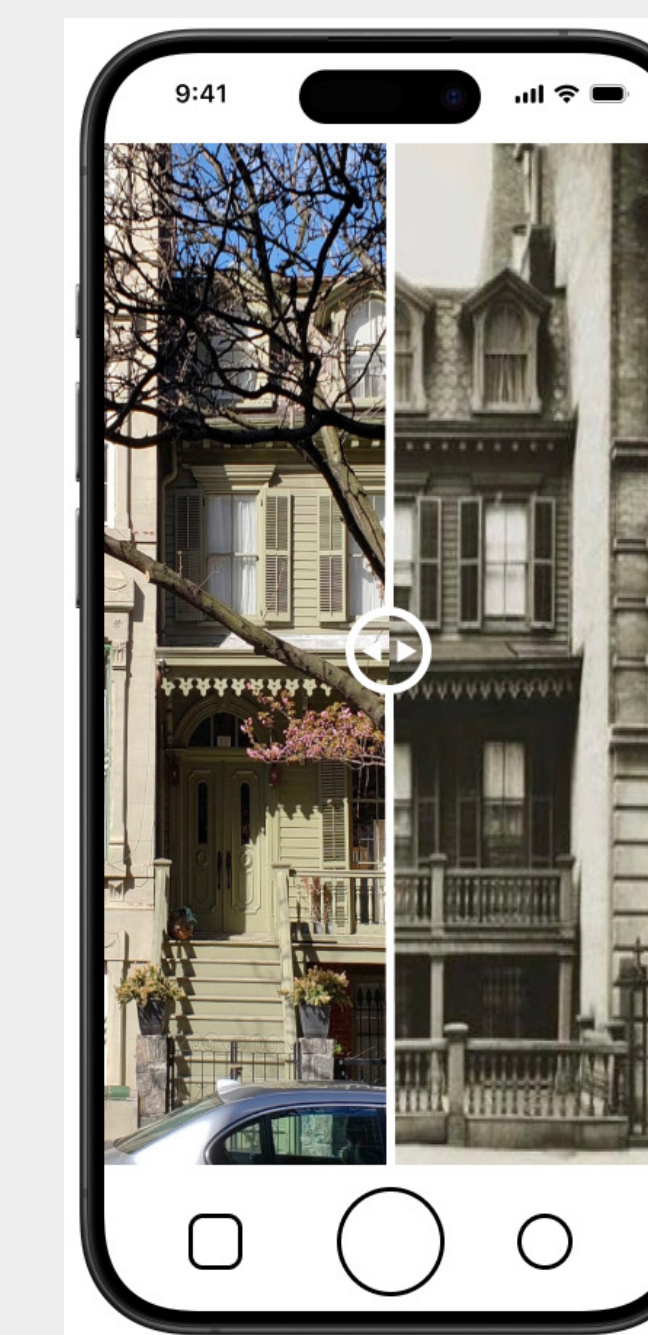


Figure 1.4



Community AR leverages several interactive features to help users explore the historical transformation of buildings. When users point their phone camera at a building, the application prompts an AR feature that displays the building's historical narrative. **Figure 1** details both low-fidelity and high-fidelity wireframes of 3 AR features we implemented. **Figure 1.1** are drawings illustrating the human-computer interaction with the mobile application. **Figure 1.2** is a feature that allows users to see what a building looks like in a specific time frame. **Figure 1.3** is a page-flip effect which allows users to visually compare how buildings changed over time. **Figure 1.4** is a slider feature that enables users to see the before-and-after transformation of a building.

Results

Our formative studies revealed a deep appreciation and desire among Harlem residents to preserve their history through AR. The results of our study further supported this, as participants expressed high levels of satisfaction, likelihood to continue using the app, and a strong willingness to recommend it to others.

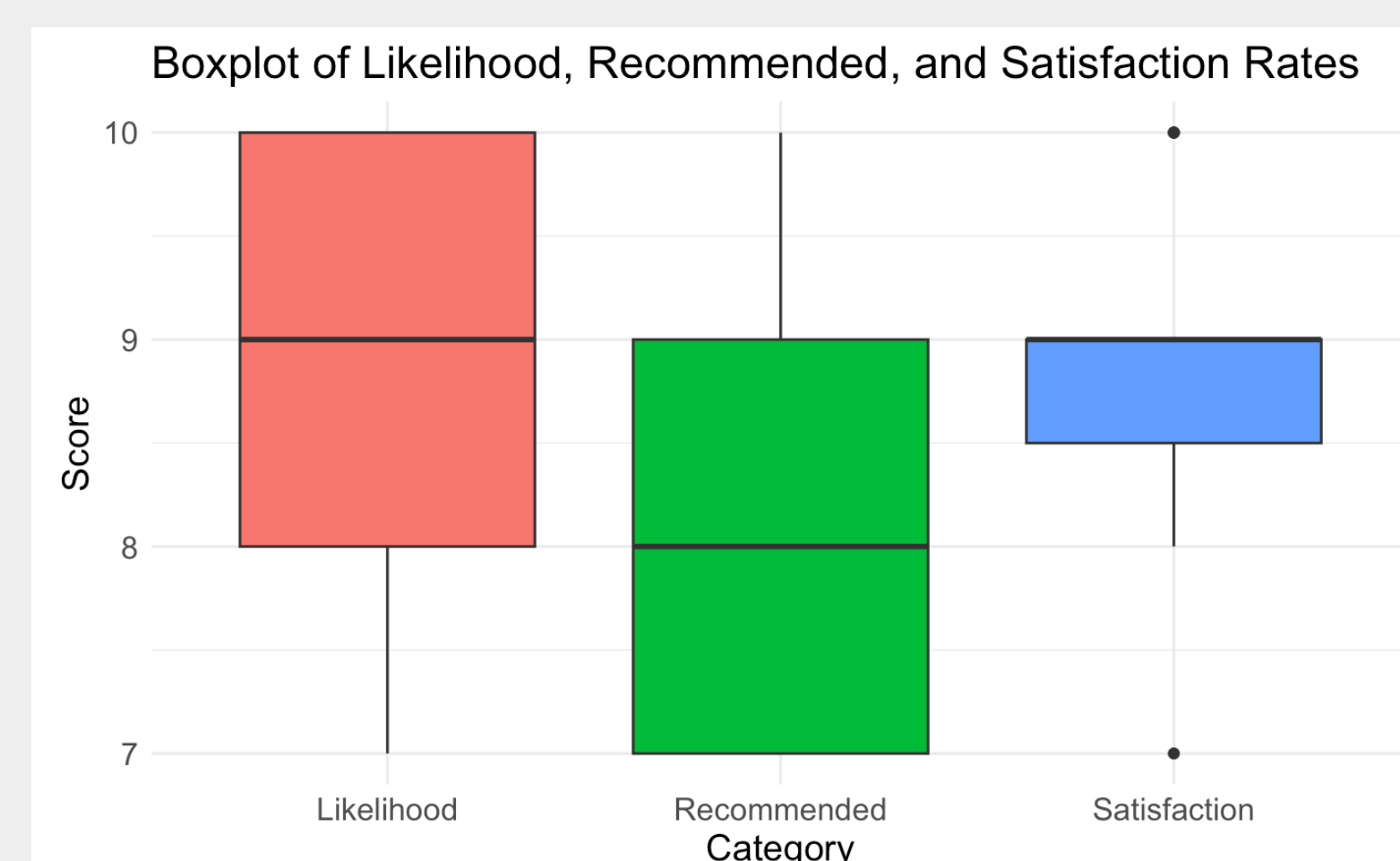


Figure 2 Quantitative results of pilot study.

Likelihood: $\bar{x} = 8.80$, $s = 1.08$
Recommend: $\bar{x} = 8.27$, $s = 1.10$
Satisfaction: $\bar{x} = 8.87$, $s = 0.83$

Results

"Oh wow, this slider is really cool! I can see how the building changed over time. But I wish there was a little label showing the years as I slide."

UI Guidance & Clarity

"The concept is amazing, but some of the AR features felt a little clunky. I had to keep adjusting my phone to get them to work."

Usability & Responsiveness

"Would be nice if this had more community stories. Maybe short video clips from longtime residents?"

Content Depth & Engagement

"The page flip effect is nice, but I almost missed it. Maybe an animation or a prompt could tell me what to do?"

AR Feature & Usability

"The AR pop-up is covering too much of the screen. I wish I could resize or move it around."

Usability & Engagement

"The AR overlay sometimes flickers when I move my phone slightly. It made it harder to stay engaged."

Figure 3 Thematic Analysis of pilot study, preprocessed through NLP, collected from interviews, focus groups, and think-aloud protocol.

Conclusion

Our findings suggest that AR can be effectively utilized to preserve community history, as participants generally expressed strong enthusiasm about AR's potential to provide more intuitive access to their community's historical narratives. However, users also stressed the need for refinements in UI/UX design to ensure the application is user-friendly, particularly around usability. These observations were anticipated, given that the pilot study was conducted with a rudimentary, beta prototype of Community AR.

Future Work

Moving forward, we plan to refine our AR features by optimizing existing functionalities to enhance the user experience, addressing technical challenges encountered during the pilot study, and developing new AR features that align with the evolving needs and preferences of our users. With these improvements, we plan to conduct formal user studies with Harlem residents and seek active feedback to ensure their opinions are fully heard. These efforts will also us to draw more definitive conclusions about AR's potential to preserve community history.

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