



Improving Accessibility for the Google Arts & Culture App

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Group 1

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Introduction

This project focuses on identifying areas of improvement for accessibility in the Pocket Gallery feature of the Google Arts & Culture app. Pocket Gallery provides users with the opportunity to explore virtual galleries and architectural spaces containing well-known works of art. Both Augmented Reality (AR) and Virtual Reality (VR) functionality is used to bring this experience to life.

The app targets individuals who are interested in art and architecture, and intends to provide them with the opportunity to “visit” famous galleries and “experience” works of art without having to travel to their physical locations.

User Flows

The high-level concept of the app is to enter a virtual gallery space, “walk” around rooms containing work of art, view works of art up close in great detail, and reading descriptions of pieces. These three flows are summarized below, then broken down further into step-by-step tasks and interactions. For this project, our team devised tasks related to one specific gallery, titled the Art of Colour.

Flow Summaries

1. **Set up and enter the gallery space:** this is the first stage in using the Pocket Gallery features. Users calibrate their phones to their surroundings, select a gallery or building, and enter the physical space on their device.
2. **Move around the gallery:** once users have entered a gallery space, they can walk around the space either by walking in their physical environment or dragging their finger to move forward/backward and turn left/right.
3. **Approach a work of art and read its description:** users can approach a painting in the gallery space and interact with it to read its detailed description.

Step by step breakdown of each task

Task 1: Set up and enter gallery space

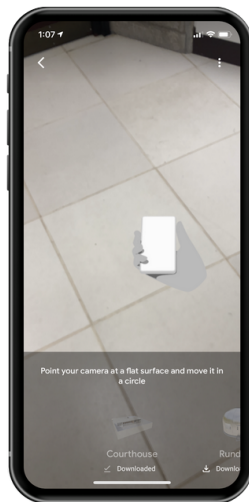
- 1.1. Tap “Pocket Gallery”.
- 1.2. Device’s camera opens and displays image a hand moving around, with instructions to point camera at flat surface and move it in a circle.
- 1.3. When space calibrates, a dot matrix is projected onto camera image view. User is prompted to download and select a gallery.
- 1.4. Once gallery is downloaded, tap and drag forward to place gallery in space. A miniature version of the gallery appears.
- 1.5. A pop up card prompts to user to enter space. User taps enter to enter.
- 1.6. Gallery enlarges to full scale and places user within virtual space.

Task 2: Move around gallery and move to “Yellow & Orange” gallery room

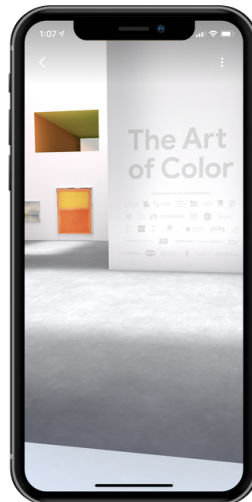
- 2.1. Basic movements: Drag down to move forward or up to move backwards; drag left or right to move left or right. Or, walk around your physical environment and movement will match on device. Tilt phone up to look up, down to look down.
- 2.2. User begins in the lobby of a gallery facing a white wall with light grey text that reads “the Art of Colour.”
- 2.3. User navigates around space using movements until they are able to see yellow and orange artwork and text on the wall reading “Yellow & Orange”

Task 3: Read description of a painting titled The Kiss

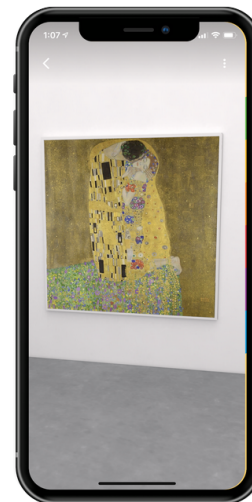
- 3.1. Once in the room, approach a work of art either by double tapping or moving forward
- 3.2. Focus camera gaze on piece until a pop up card with title appears.
- 3.3. Drag up card to view and read detailed text description



Task 1: Set up and enter gallery space



Task 2: Move around gallery space to Yellow & Orange room



Task 3: Find a painting and read description

App screenshots showing portions of each flow/task.

Personas

Persona #1: Julie Weiss

Age: 28
Occupation: Art history student
Disability/Impairment: Nystagmus (vision impairment)

Julie is a 28-year-old art history master’s student. She has nystagmus, a form of blurred vision, vision condition in which the eyes make repetitive, uncontrolled movements. These movements often result in reduced vision and depth perception and can affect balance and coordination. In Julie’s case, she can only see with 30% clarity compared to an able-visioned person.¹ Low contrast imagery and reading small text are often prohibitive features of apps for her.

Despite this, from a young age Julie was always fascinated by the bright colours and vibrant shapes she was able to recognize in art. She is passionate about studying art history, and wants to see as many famous works of art from as many periods and movements as she can. She is excited that the Arts & Culture app can let her experience famous art and galleries around the world, on a student budget. Her challenges with the app currently include difficulty reading small text instructions, difficulty seeing low-contrast text and paintings, and difficulty with depth perception in gallery spaces.



“I’ve loved art and art history my whole life”

GOALS

- To see as many works of art as she can
- View some of her favourite paintings up close
- Learn about art, artists, and famous gallery spaces



CHALLENGES

- Small text in apps is very hard for her to read
- Low contrast text and imagery
- Depth perception in visual spaces is difficult for her

¹ American Optometric Association, 2020. <https://www.aoa.org/patients-and-public/eye-and-vision-problems/glossary-of-eye-and-vision-conditions/nystagmus>.

Persona #2: Marcus Holt

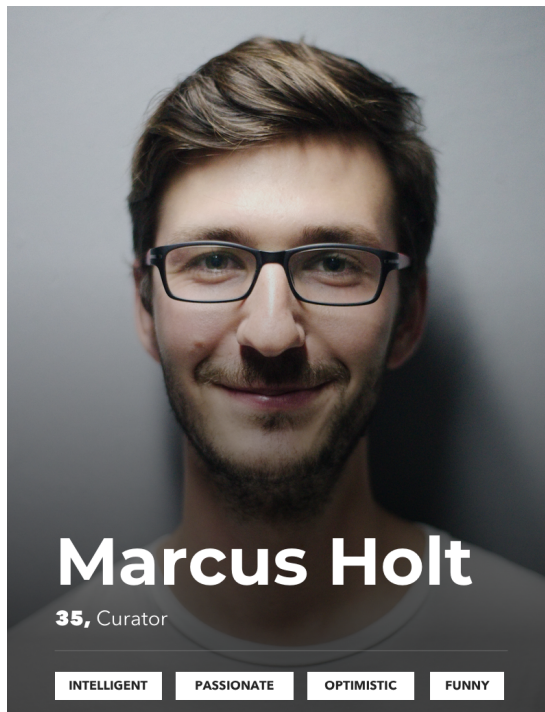
Age: 35

Occupation: Art Curator

Disability/Impairment: Multiple Sclerosis (physical disability)

Marcus is 35 years old and a lover of art. He used to be a painter and aspiring artist, but with the onset of his MS, he has grown to find painting more physically difficult. Thankfully he has found a new passion in the art world curating shows featuring his vast network of friends artists. Now, as part of his newfound curating career, he is interested in visiting as many gallery spaces worldwide as he can. He is looking to the Arts & Culture app to visit virtual galleries and other architectural buildings to broaden his understanding of how space can be used to mount physical and virtual gallery shows.

With his MS, his accessibility issues include a lack of hand/eye coordination, weakness, tingling, cognitive impairment, and balance problems.^{2,3} His challenges using the app to achieve each task include difficulty with anything requiring steady hands (such as focusing his device camera on an image, or moving his phone in a circle to calibrate the space); physical movement (walking around the gallery space), and fine motor skills (steady dragging, concentrated tapping).



“I’ve found my new passion, and I couldn’t be happier!”

GOALS

- See interesting gallery spaces and get inspired
- Experience famous buildings without having to physically be there
- Learn about curation and current gallery practices



CHALLENGES

- Keeping his device steady and oriented properly
- Occasional blurred vision
- Fine motor control and multi-digit gestures

² Healthline, 2020. <https://www.healthline.com/health/multiple-sclerosis/effects-on-the-body#1>.

³ MS Society of Canada, 2020. <https://mssociety.ca/about-ms/what-is-ms>

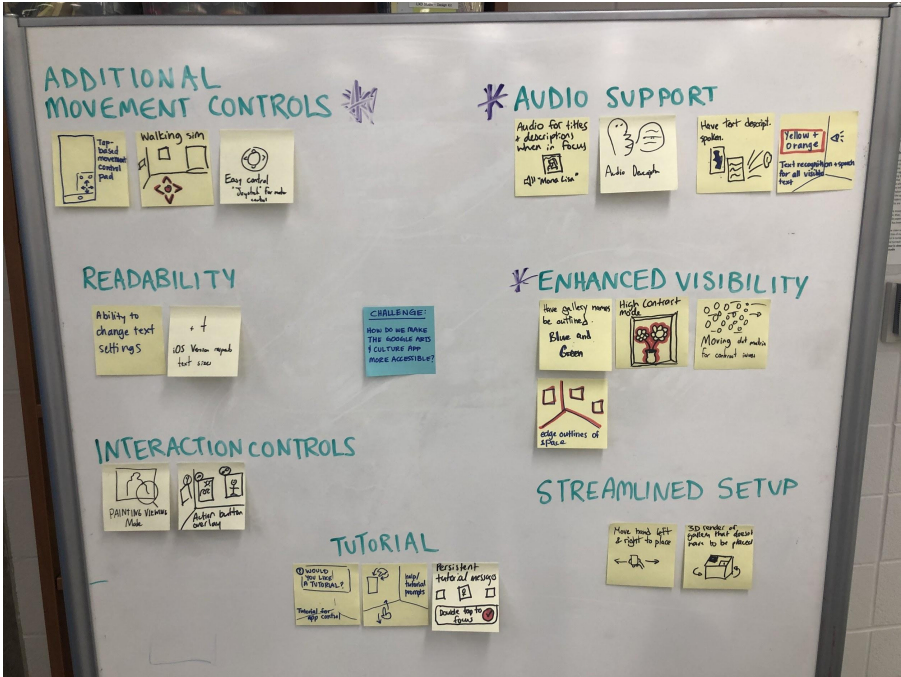
Process

1. Research

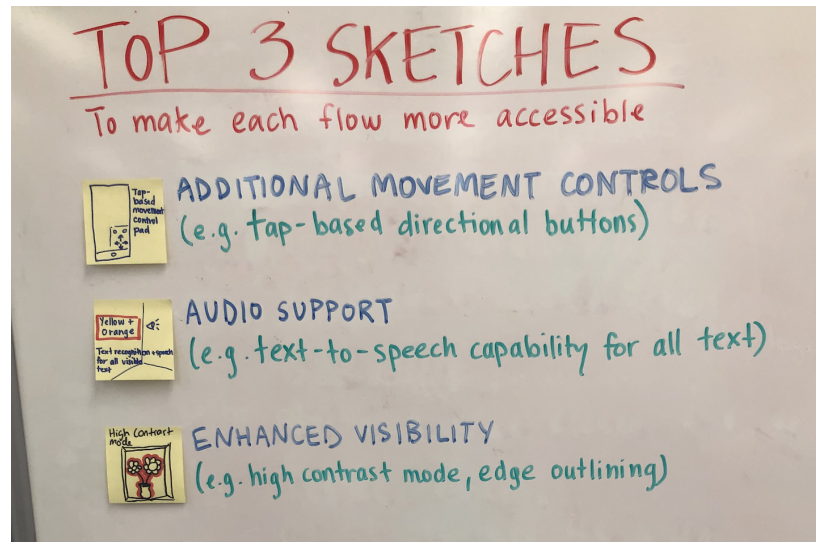
We began our process by identifying the Arts and Culture App as an AR experience we wanted to improve. We examined the app to understand its functionality and explore what sorts of accessibility issues might arise. As a part of this process, we built a paper prototype in the form of a video to identify key features of the app and showcase the user flows involved with using those features. This paper prototype allowed us to simulate the App's existing AR functionality and to become familiar with the experience it provides. Based on this experience, we built Personas with needs that may not currently be fulfilled with the existing app.

2. Design

With our Personas as a jumping-off point, we brainstormed some ideas for how to improve the accessibility of the app in the form of 20 different sketches. We discussed our ideas and sorted them using an affinity diagram to show major themes that arose. The major ideas we decided to focus on were: additional movement controls, audio support, and enhanced visibility.



Mapping and sorting sketches of potential accessibility solutions.



Our top three sketches of accessibility solutions.

3. Feedback & Iteration

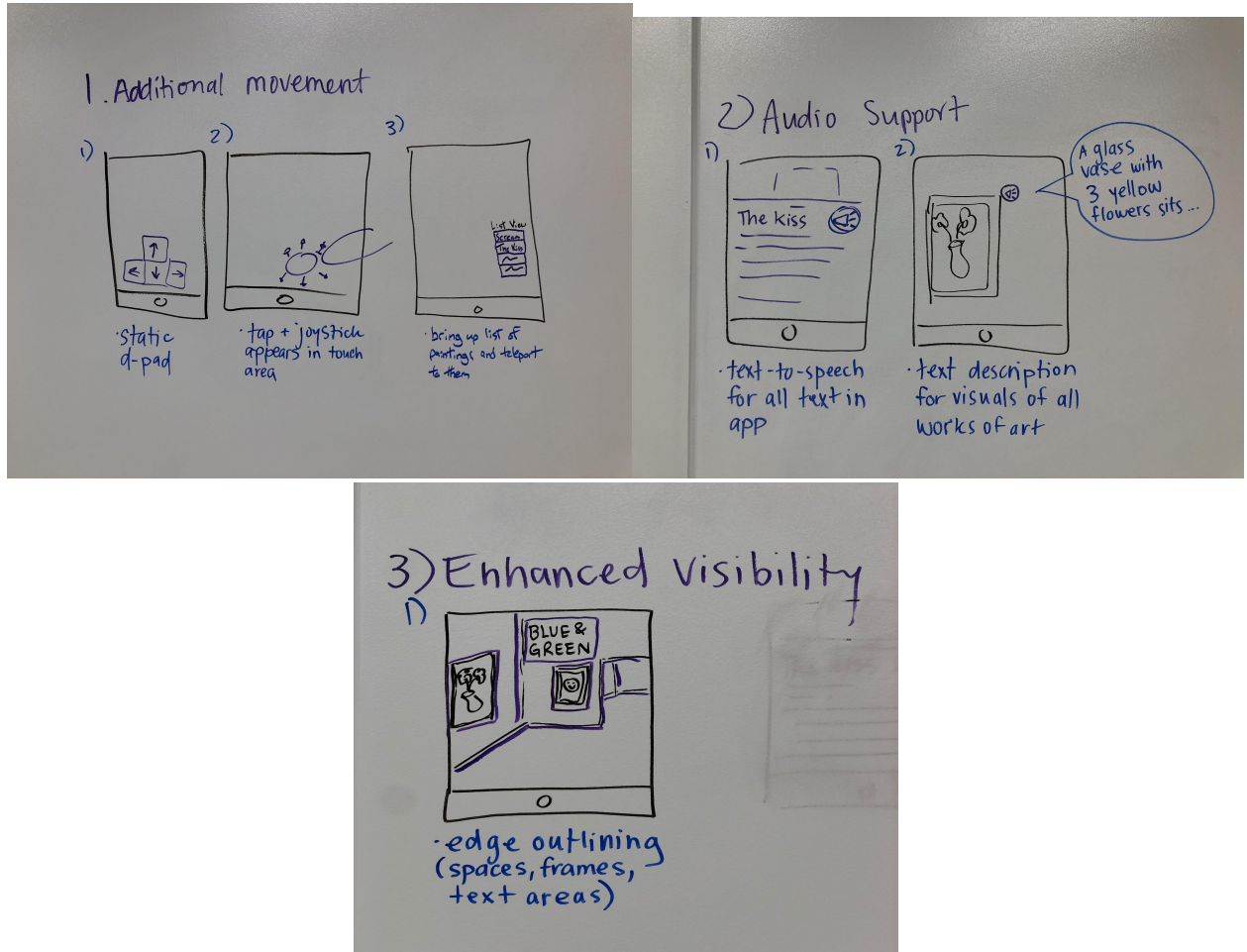
We showcased our design to a group of designers to elicit feedback on our ideas. From this session, we were given specific suggestions for how we might be able to implement the changes we envisioned. After this, we got together to brainstorm how to actually implement these changes. We came up with a number of design ideas and prototyped them in the form of video. The ideas we focused on including were: new forms of movement using a directional button (D-pad) control scheme and a list view to teleport to specific galleries, adding audio support that can read out text within the app, and alternative visual settings to improve the contrast of objects and edges in the space.

Our D-pad and list view was implemented to resolve some of our concerns with the current movement and control scheme in the app. With those changes, we sought to appeal to users like Marcus who may have difficulty with moving their device in space or using sweeping, multi digit gestures to navigate the virtual space.

Our decision to include in-app audio support was due to the lack of support for persons with visual impairments. As the Arts and Culture app also didn't support text to speech on the OS level, we included it in our second prototype to understand how it might be implemented in-app.

The alternative visual setting "edge outline" mode was implemented to aid users like Julie navigate the 3D space and aid with depth perception. Additionally, edge outlining also marks paintings and gallery titles to help users identify interactive elements.

This second prototype was then presented for more feedback.



Brainstorming ways to implement accessibility improvements based on feedback.

Summary of Suggested Improvements

Flow/Task	Issues	Solution
Setting up the gallery	Marcus: Requires controlled motor skills to move phone in order to map projection space, as well as to drag gallery into physical space once area is mapped.	Remove AR functionality and enter virtual gallery space directly. Include static text instructions that can be read aloud with text-to-speech.
	Julie: Tutorial text is small and disappears quickly.	
	Julie: Dot matrix is small and white, and is difficult to see against a white low-contrast background	
"Walking" around gallery space, either by movement with fingers on screen	Marcus: Requires body mobility to physically walk around the space you are in, which Marcus struggles with.	Static d-pad allows tap-and-hold movement around the gallery space in four different directions. List navigation with text-to-speech capability allows rooms to be read aloud to users. Tapping room names allows users to teleport directly to different spaces. Edge outlining highlights edges of rooms, works of art, and text on the wall. Text-to-speech capability allows her to read names of gallery spaces.
	Marcus: Difficulty using fingers for small, controlled movements to navigate by dragging.	
	Julie: Text on the wall indicating room names is in grey on white; low contrast is difficult to read.	
	Julie: Difficulty with depth perception and recognizing boundaries of gallery's physical space.	
View a work of art up close, read its description	Marcus: Needs to be within a certain distance of painting to see description and dragging gesture to pull up description card.	Alternative text which can be read aloud to describe image details. Tapping gesture to pull up description card. Text to speech capability for all painting descriptions.
	Julie: Difficulty seeing painting details or reading the painting title and description	

Reflection

Upon reflection, we find that we question some fundamental aspects of our design and the Google Arts and Culture AR features in general. Firstly in regard to how our application implemented text-to-speech and text size-adjustment within in-app features, and secondly in regard to the AR nature of the app's "Pocket Gallery" itself, some aspects of which our accessible design implementations removed completely.

System-Level vs. Local-Level Implementation

During our design process, we had some debate as to whether or not certain accessibility features should rely on system level support. The question of whether text-to-speech and text-size adjustments should be implemented on the local-level (within the app's settings) or on the system-level (within the mobile devices settings) was something we were not certain of. While system level implementation (i.e. providing metadata that can be interpreted by Android/iOS text readers for the text and objects within the app's Pocket Gallery space) provides a solution in which interfacing is universal with all other mobile apps for the user with a disability, we decided to go with local-level implementation so that text to speech/text options options were more customizable for users with disabilities such as low vision, who may need assistance reading and interpreting certain text and objects but not others. However, upon further research into accessibility best practices, it seems the universality of system-level implementation may actually be the preferable option, as the universality of system-level text reader and text adjustment makes transitions between different apps more effortless for users with disabilities.

Necessity of AR Functionality

The secondary source of reflection on our design itself was the AR Nature of the "Pocket Gallery" feature itself. Our redesign of the flow for our first task - allowing the user to skip the step in which they must place an AR model of a gallery and "enter" it by physically moving into it to activate virtual gallery viewing - basically makes the most explicit "AR" feature of the experience redundant, which calls into question if we've removed an important aspect of the app for users with disability. It led us to question if our design would then deny users with disability an experience of the app equal to that of able users, and ultimately if the AR aspect of the feature mattered at all to the function it was meant to provide users. We ultimately are not certain if the AR aspect of these feature serves a fundamental purpose outside of a fun "gimmick" for users, as all aspects of the Pocket Gallery feature would potentially be easier to control for users of all abilities and more technically functionally by replacing the AR gallery with a 3D model that can be viewed using conventional 3D viewing controls (e.g. pinch to zoom, swipe to turn, etc.). Further research into understanding what the purpose of the app ultimately was, and how AR functionality figured into that purpose, would have guided our design choices to be more informed.

Work/Design Process

Both of these design issues we found in our design are related to our work process, which would have been improved by focusing more on research rather than coming to conclusions based on our own assumptions.

Additional secondary research into the Google Arts and Culture App may have provided us with a greater level of depth in our analysis of the Pocket Gallery feature. Our assumption was that Pocket Gallery would be used by fans both art and architecture due to the ability for users to experience a 3D space, and the paintings therein through AR. Our suggestions for accessibility improvements are based entirely on this assumption, and additional research into users' perceived value of the feature would have been helpful to fully inform our recommendations.

Conclusion

In addition to providing us with greater insight into how accessibility design requires a higher level of research to ensure disabilities are accommodated according to user needs (and not assumptions of users needs or preferences), a high-level take-away from our first AR/VR UX Design project is the more fundamental role research plays in informing great design; a more considered perspective on the purpose of the app and the user-base it serves would have provided us with more critical insights to inform our design decisions.

Appendices

Feedback Presentation #1

https://docs.google.com/presentation/d/1_hUtE0T7U35Qs0aOB1NqhhwSnJ_bj7WbJXSaE4_Z6og/edit?usp=sharing

Paper Prototype #1 (Video)

https://drive.google.com/file/d/1PEZWVHfoj_X2OrWoi7HpB9PnWF9P_Jhm/view?usp=sharing

Feedback Presentation #2

https://docs.google.com/presentation/d/1Bpt4eqN0p-ekGrZmRU3CBou_bU2Tx1IOLKHV5QzrcSQ/edit?usp=sharing

Paper Prototype #2 (Video)

<https://drive.google.com/file/d/1rTYc4IBQMe7-A5k125-YapAJxIKy4Mll/view?usp=sharing>