CanTour

bespoke museum tours

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I. Problem and Solution Overview

Museum visitors are often overwhelmed by the wealth of information available to them. They may also have trouble finding works of art that match their artistic preferences. We want to help museum visitors see what they most want to see by creating personalized tours. The tours guide each user through the museum and highlight art they will particularly enjoy. Before users enter the museum, they take a quiz, the results of which are used to create a personalized art preference profile. Using the results, a path through Cantor is presented, featuring works of art that align with their interests. Areas of interest are highlighted on a digital image of the painting, along with additional information.

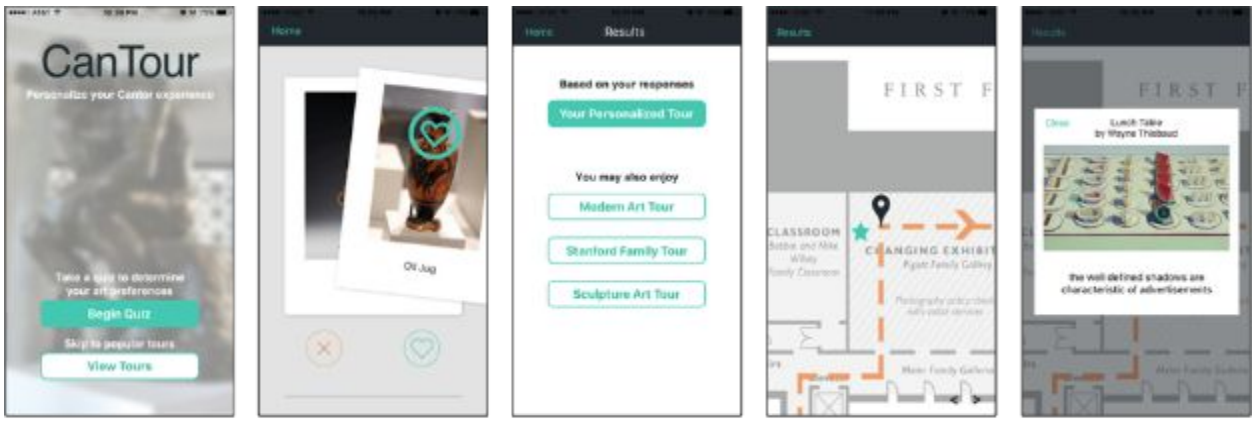

Figure 1: Design overview

II. Tasks and Final Interface Scenarios

Task #1: Art Preference Quiz (Moderate)

Our first task was for a user to take a quiz to determine his/her art preferences. We classified this first task as our moderate task. There is a relatively wide range of exhibits available at any given time in Cantor, but, as we found in our initial needfinding, many Cantor visitors are interested in only a subset of the exhibits. Our quiz provides an interactive experience that helps users understand their personal art preferences. Inspired by the dating and social discovery app Tinder, our quiz presents a series of Cantor pieces which the user swipes right or left to indicate his or her feelings towards it. Upon completion of the quiz, our app processes the results and presents a customized tour based on the user's preferences. We also suggest a few other tours that the user may be interested in.

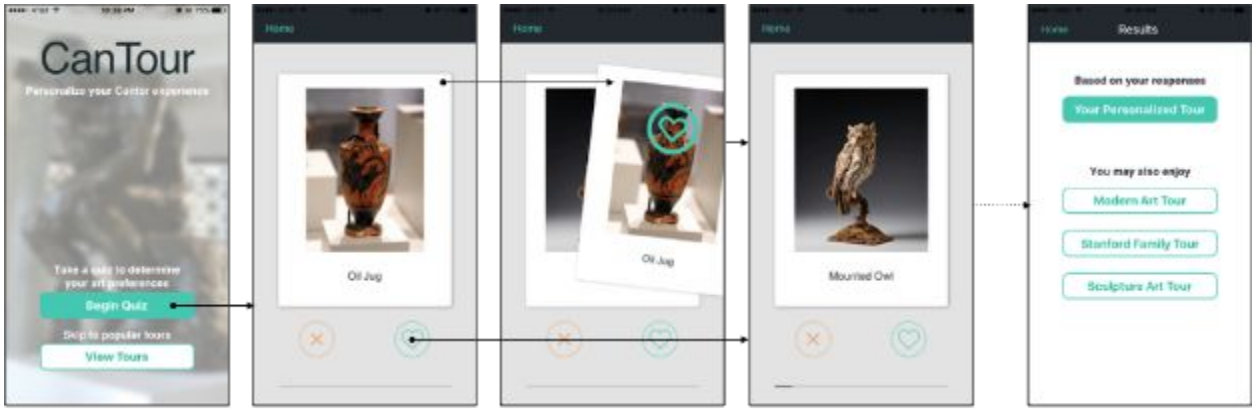

Figure 2: Task flow to complete quiz task and generate personalized tour

Task #2: Museum Navigation (Complex)

Our second task, the complex task, is comprised of the user navigating through Cantor based on their selected tour. Upon selecting a tour, the user is shown a Cantor floorplan with a route detailed via arrows. The user navigates through Cantor along the route. The tour also highlights specific pieces of art that the user is likely to be interested in based on their quiz results.

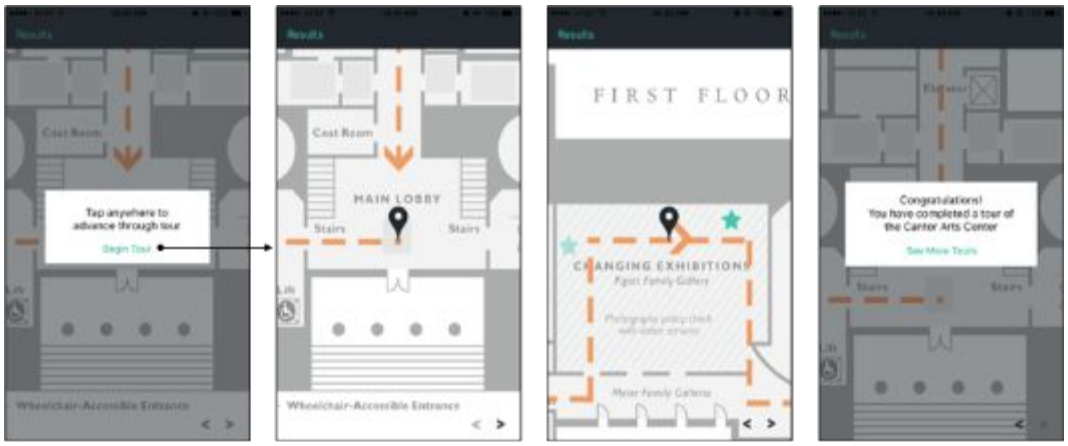

Figure 3: Task flow to navigate Cantor based on seleceted tour

Task #3: Learn More (Simple)

For our third task, users learn more information and read detailed analysis on pieces of art along their personalized tour route. On the tour map, users can tap on the icons indicating interesting paintings, at which point a separate screen appears. The screen contains an image of the piece of art with particular features highlighted. Tapping one of these icons displays more information and analysis on that part of the painting.

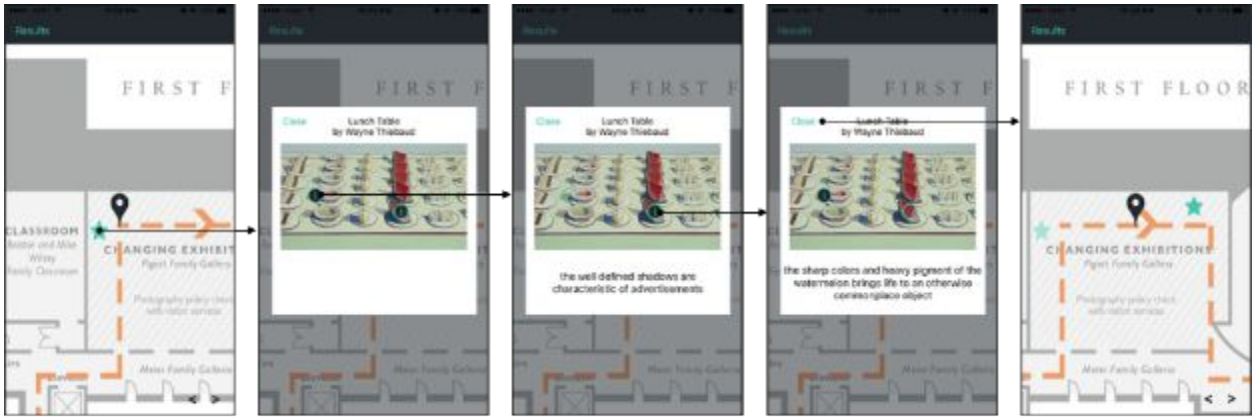

Figure 4: Task flow to learn more about a highlighted piece of art

III. Design Evolution

Needfinding and Concept Generation

There were several key steps along our design journey. The first stage of the design process was needfinding. Once we decided on Cantor as our problem space, we knew we would gain the most useful and truthful insights by performing needfinding with actual Cantor visitors. Thus, we conducted 11 initial interviews with a wide array of Cantor stakeholders, from the head of exhibitions, to art aficionados and artists, to inexperienced adults, students, and children. We consolidated these interviews and constructed empathy maps for our interviewees. From these interactions, we developed POV statements and HMWs. We picked up on the idea of making a museum experience more responsive to to a visitor's personal preferences and opinions. Inspired by short "personality quizzes" on sites that incorporate recommendation engines such as Pinterest and Netflix (see Figure 5), we elected to compile a short questionnaire about a guest's tastes in art, which would then produce recommendations as to what they might enjoy viewing. Our sense was that such a system might combine elements of a traditional guided tour through a museum with the flavor of a visitor's particular tastes. Moreover, we saw the quiz model as an opportunity to address a problem that came up in several of our needfinding interviews - visitors, upon visiting a museum like Cantor, are often overwhelmed by the volume of works they could potentially view and do not quite know where to start. If a visitor were given suggestions as to where to begin, some of this off-putting indecision might be averted.

Figure 5: Examples of recommendation engines by Netflix & Pinterest

Experience Prototypes

This quiz idea was encapsulated in our first experience prototype (see Figure 6). We tested this particular prototype at Cantor Arts Center itself. We provided our testers with our questionnaire and prompted them to select one painting among each set of four, and then mapped out a path to the relevant areas of the museum. From our testing, a few elements that worked well, as well as some that didn't, emerged. As per our assumption, the guests we spoke to were excited by the notion that a quick, self-directed quiz might ease or structure their museum-going experience by giving them a starting point within the museum. On the other hand, at certain points, testers found it hard to choose between two equally appreciable pieces of art for the purposes of the the quiz. As a result, our next prototype only presented one piece of art at a time, to which the user would respond positively or negatively.

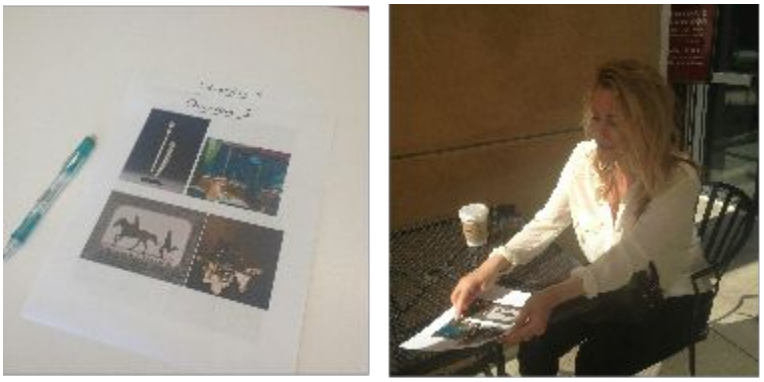

Figure 6: Our quiz experience prototype and a Cantor test subject

We also developed two other experience prototypes. For the first, we attempted to shift the focus to the visitor's creative potential rather than the artist's intentions. To create an experience prototype, we printed out pictures of paintings from Cantor and collected a number of colored markers. We gave these materials to a group of 10-11 year old schoolchildren on a field trip and observed their behavior. While the activity was certainly fun and engaging for this particular audience, we felt the target audience of this concept would be limited to children and wouldn't provide as informative experiences to older visitors. For this reason, and because such an art tool would be much more difficult to implement, we decided not to move forward with this prototype.

Figure 7: Drawing and coloring experience prototype with young Cantor test subjects

With our final experience prototype, we sought to enable personal curation of observed art pieces for each visitor. We made a prototype by printing out potentially appealing pieces of Cantor art for guests to choose from. We then offered these cut-outs to museum-goers, encouraging them to select among the paintings and collage and rearrange them as they wished (see Figure 8). Our testers enjoyed the active task, as they were particularly fond of arts and crafts and noted the similarities to the visual discovery tool,

Pinterest. Though our users were excited by the activity at the outset, towards the end of the process, they became rushed and easily distracted. Because of this prototype's inability to maintain a user's focus for a long period of time, as well as the fact that the app had less potential to be informative, we also ceased developing this idea. After conducting all three experience prototypes, we elected to move forward with the quiz recommendation model as it introduced a new, unique element to the museum experience that our testers showed significant enthusiasm towards.

Figure 8: Pinterest inspired experience prototype and Cantor test subjects

Concept Sketches

We began flaring out our application idea with concept sketches of different design realizations to explore the space. Our sketches spanned three input/output modalities.

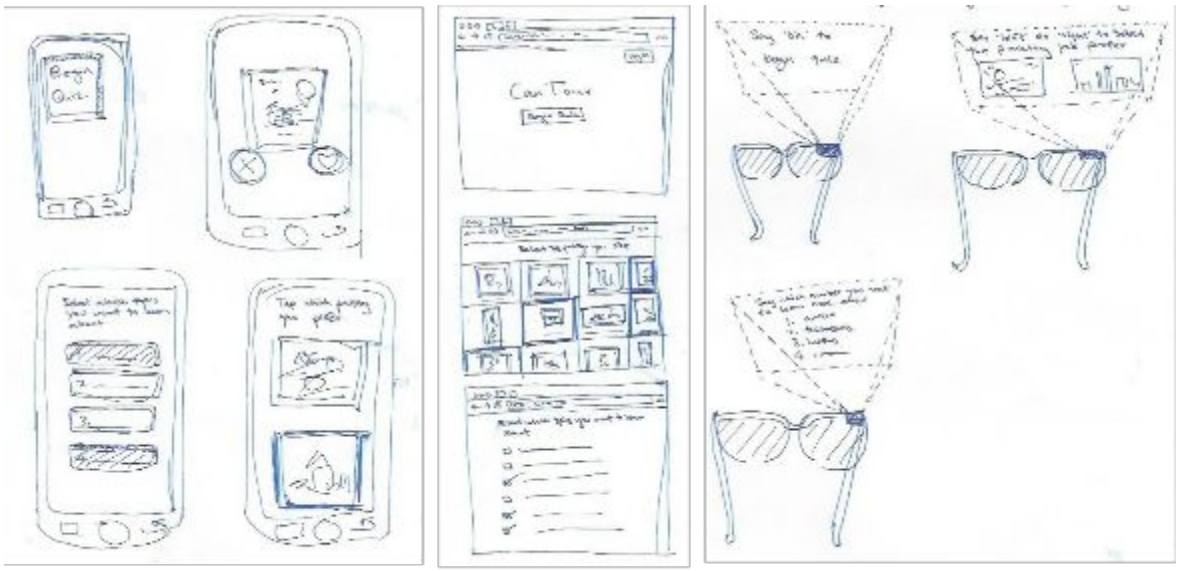

Figure 9: Concept sketches, including native mobile app, compu web app, and Google Glass app

From these different modalities, an augmented reality display would cause difficulties in performing the initial quiz without a physical interface. A non-mobile responsive web

application would require all the data to be generated before entering the museum, and then printed for use inside the museum. This meant that the app would be static once inside the museum and users couldn't view a new tour. Thus, we chose to develop a mobile app because it was the most accessible to our target demographic - nearly every visitor to Cantor has a smartphone. We chose a native mobile app as opposed to a mobile-responsive web application, since it makes it is easier to use native features of the phone (ie. gyroscope, accelerometer) and it is easier to build in transitions between screens and use traditional mobile app gestures. With that in mind, we storyboarded our interface designs in more detail, sketching a task flow for each of our three tasks (see Figure 10).

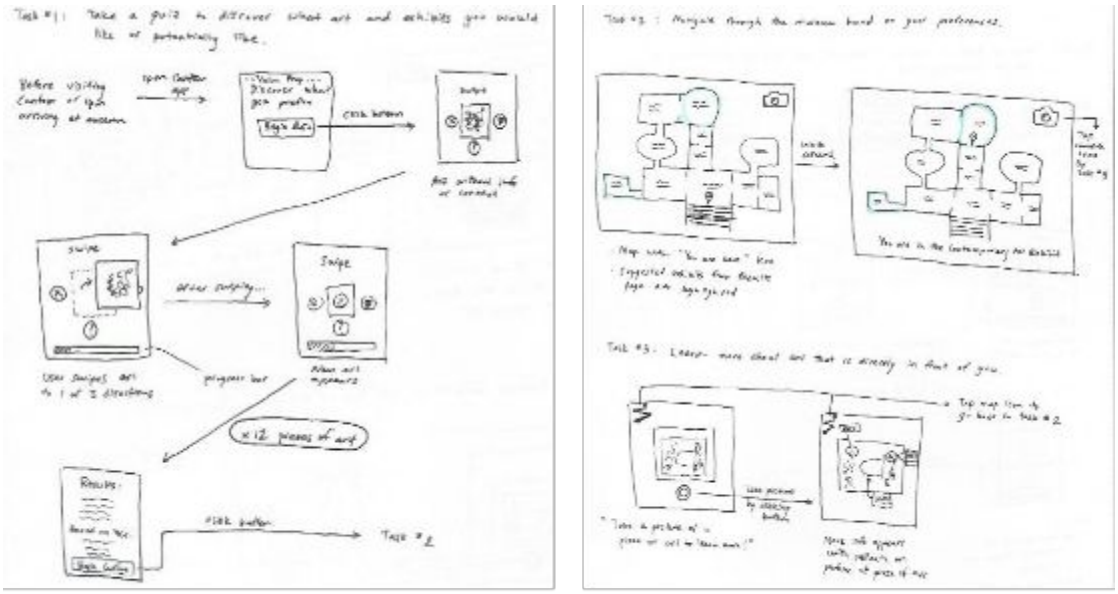

Figure 10: Interface storyboards for our three task

Low-Fidelity Prototypes

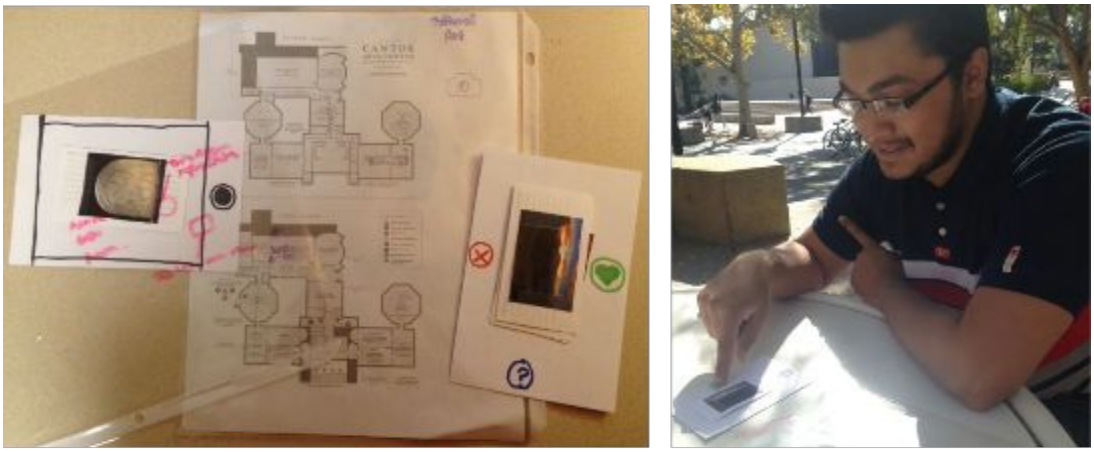

Figure 11: Low-Fi prototype system and user testing

Next, we created low-fidelity paper prototypes for our three tasks (see Figure 11). To represent the first task, a quiz to determine user's art preferences, we created a swipe-based interface. The user would work their way through the stack of paintings, swiping right to like and left to dislike, until they had swiped away the entire stack of paintings. To represent the second task, creating a map to navigate the users through Cantor, we printed out a floor plan of Cantor. We then overlaid a transparency with a route through Cantor that we created based on what the user had said they liked and didn't like. To represent the third task (getting more information on a particular painting) we had a button on the map that users could click which would take them to a camera mode where they could pretend to take a picture. We would then place a picture of the painting they took on the screen (the large index card) and overlay a transparency on which we would circle areas of interest and write text with information about the painting.

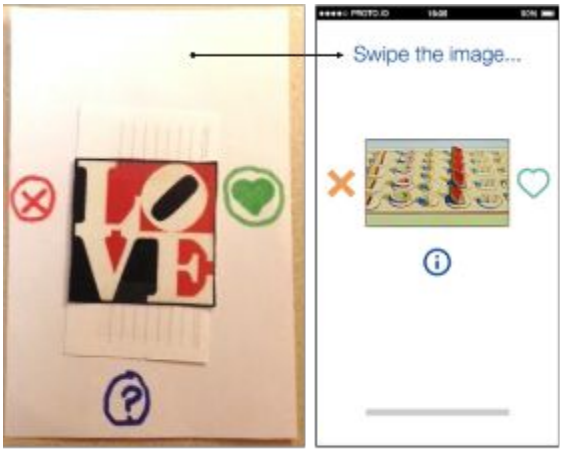

Figure 12: Swipe instruction on first quiz screen

We tested our prototype on 4 users of varying age and technical competency, and our observations and their feedback led to several key design changes. Most users mistook the heart and X icons on the screen for buttons to press rather than regions to swipe the picture in question toward. For our next prototype, we added a swipe instruction on the first quiz screen, as well as allowed the user to tap the icons (see Figure 12). All participants were confused by the presence of the neutral question mark icon, and most believed it was a feature to permit better understanding of the art in question, rather than an opportunity to express ambivalence or uncertainty as was originally intended. We changed this icon in the medium-fidelity prototype to match our users' assumptions (see Figure 13). With regard to the map interface itself, it was clear that presenting the entire floor plan to users was overwhelming and included too much detail for this map to be useful, so we cut down the information shown on the screen by zooming in on a particular part of the map, and shifting the map portion of interest as the user moves (see Figure 14). Finally, our user testing revealed that taking a picture of the art was more of a tedious activity rather than a fun one. Thus, we simply had an image of the highlighted art appear in our next prototype.

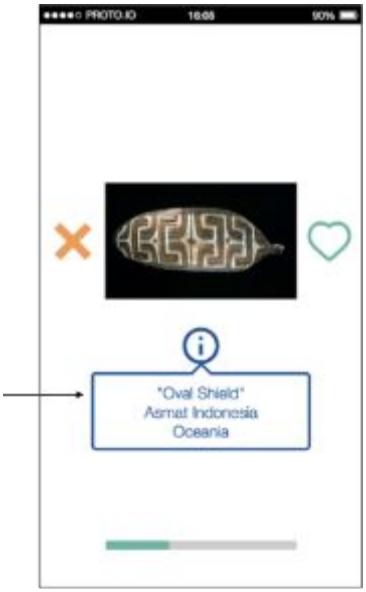

Figure 13: Blue icon opens info window for med-fi prototype

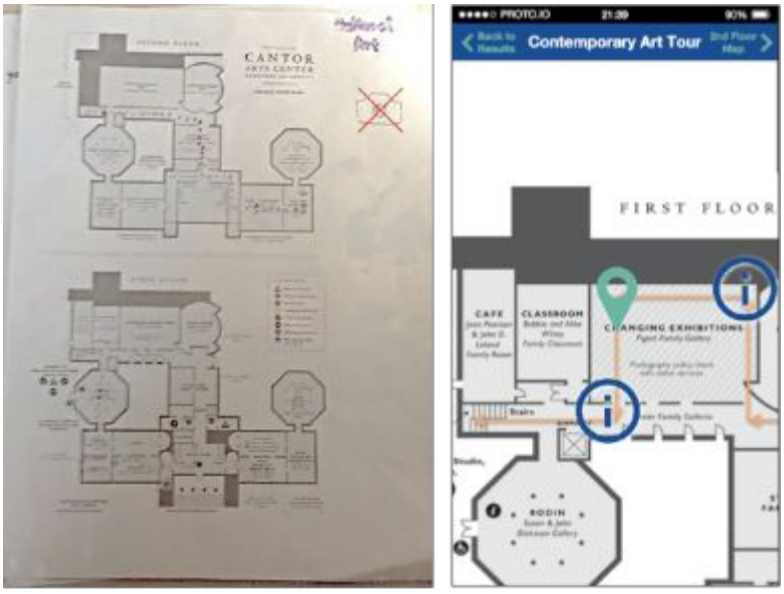

Figure 14: Med-Fi prototype map has narrower scope that follows user's location and no camera icon

Medium-Fidelity Prototype

Using these results, we redesigned our interface and built a medium-fidelity prototype with Proto.io. A heuristic evaluation was conducted on this prototype, the results of which are discussed below.

IV. Usability Problems Addressed

Major Heuristic Violations

Based on a heuristic evaluation of our medium-fidelity prototype by 3 expert users (fellow students in our studio), we made several design changes when implementing our hi-fi prototype. We will first examine our highest severity violations.

- Skip quiz option

  [H2-7 Flexibility and efficiency of use] [Severity 3]

  Our app may be used by "expert" users, defined by users that already know what genre they are interested in or that have already used CanTour before and wish to have a different experience. In this case, a user may not want to discover their preferences. Thus, we added a "view tours" button to our homepage that skips our first task, the quiz, and jumps to a list of popular tours (see Figure 15).

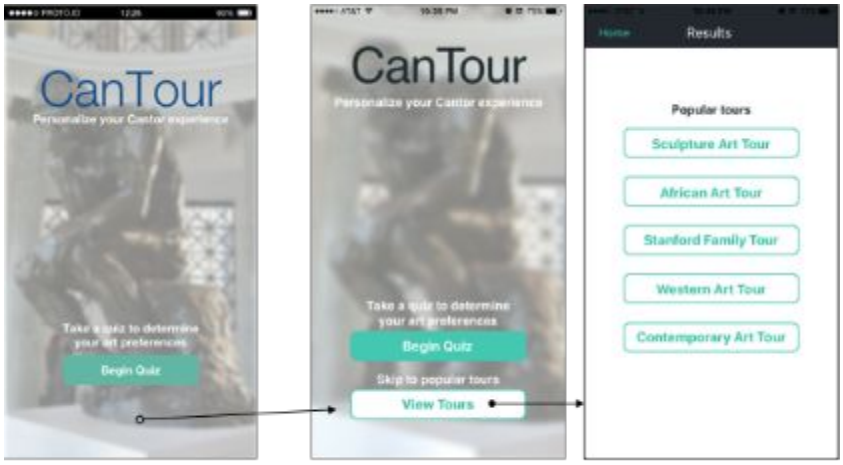

Figure 15: Unlike med-fi prototype, hi-fi prototype has "View Tours" button that skips to list of popular tours

- Map's predefined scope
  [H2-3 User control and freedom] [Severity 3]
  In our medium-fi prototype, the map had a single, predefined scope around the current location. As a solution, we envisioned pinch interactions common in most existing map applications. This would allow users to zoom in for more precise locations or to zoom out for an overview of the tour. Additionally, a "Re-center" button would appear once the user has pinched, inspired by the Google Maps interface (see Figure 16). However, due to technical limitations, our hi-fi prototype does not exhibit these features. Specifically, the pinch interaction posed a technical challenge when layered upon the animations we used to advance the map from POI (point of interest) to POI. A future iteration of this app could utilize a different strategy for map navigation and in this case could potentially utilize a pinch interface. A "re-center" button thus proved unnecessary.

Figure 16: Proposed re-center button

- Quiz: lack of “undo”
  [H2-3 User control and freedom] [Severity 3]
  During the quiz (see Figure 17), there is no option for users to “undo” or “go back” if they accidentally like or dislike an image. In theory, the only way to recover would be to restart the quiz. However, we decided to maintain our current design without such an option for a few reasons. First of all, the quiz task is meant to be quick and dirty; we want to get the user through as many questions in a short amount of time. Adding a button would detract from the minimalist design and potentially distract the user. Moreover, an undo option would emphasize accuracy too much, an undesirable sentiment given that one “mistake” in the quiz will not drastically affect the resulting tour options. Additionally, if a user felt a strong need to revise a preference, after finishing the aforementioned quick and dirty quiz, he or she could always retake the quiz, which is an option presented on our results screen.

Figure 17: Med-fi prototype quiz screen

- No option to respond to a painting
  [H2-7 Flexibility and efficiency of use] [Severity 3]
  Our heuristic evaluators suggested that we allow users to respond in a positive or negative way to paintings during our third task, when they are learning more about a specific piece. This would be a valuable source of data to judge the success of our quiz task, as well as to further personalize and adjust the tour. Once again though, we decided to maintain our current design. To us, this could be categorized as a feature request rather than a heuristic violation. In fact, our tours are specifically curated via the results from the quiz results. We made this decision on how to generate and evaluate results because we wanted to present this task early and separate from the actual tour experience. Asking users to respond to paintings could detract from task

#3, and we believe cross-pollination between these tasks would not be beneficial in this case because it would decrease the efficiency of use. While it is an innovative and novel way to gather data and improve the experience, this feature would require significantly more back-end work and thus will not be part of our minimum viable product.

Figure 18: Mockup of response system proposed by heuristic evaluators

Minor Heuristic Violations

We also collected a number of minor heuristic violations that led to numerous design changes. The most significant of these are presented below.

- On the results page, the tour titles are now buttons. Previously, there was significantly more text with tour descriptions and separate buttons. The result: a busy screen. We removed the descriptions, made the tour titles the buttons, and extended the buttons across the entire screen. The result: a simpler, more comprehensible screen. We also changed the name of the recommended tour, emphasizing it was created for the user.

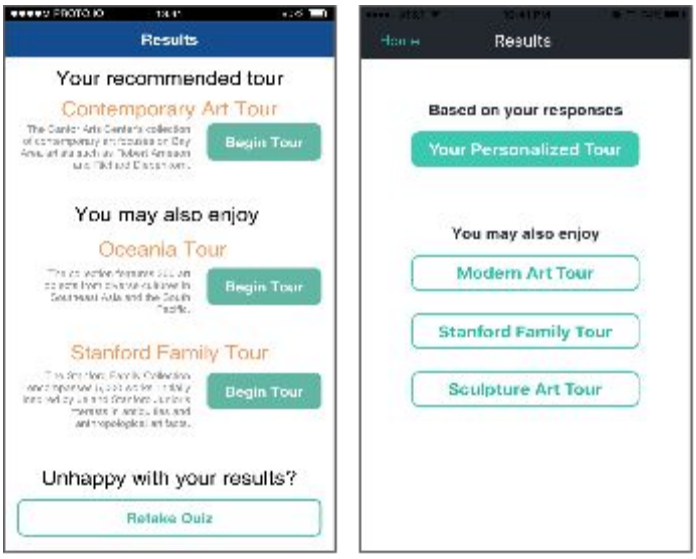

Figure 19: Med-fi and hi-fi prototype juxtaposition of results screen

- After visiting a point of interest on a tour, the star icon on the map will become lighter. This gives the user an indication of their progress along the tour, reminding them which paintings have already been visited and how many stops remain.

Figure 20: Previously visited POIs faded

- The default scope around the user's location will be closer. In our med-fi prototype, the initial scope was zoomed out too far. In combination with large icons denoting pieces of interest, our evaluators noted that users wouldn't know specifically which painting the icon referred to. In fact, some of our icons spanned multiple rooms. With a closer default zoom and slightly smaller icons, there is more clarity about where exactly the user should focus.

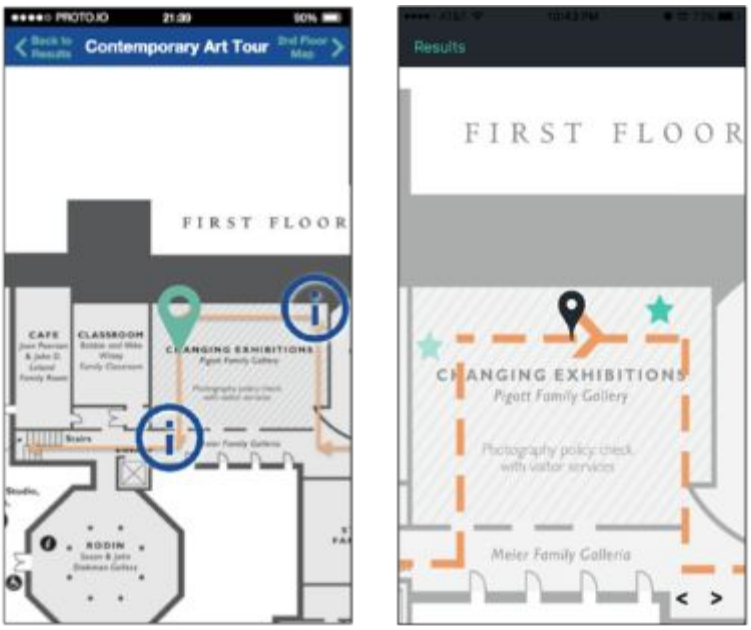

Figure 21: Changes from med-fi to hi-fi prototype maps include narrower initial scope and smaller icons

- We made a final change to our color scheme - we brightened our teal and orange, and by replacing the navy color in our med-fi prototype with a very dark gray, we reduced the number of hues used.

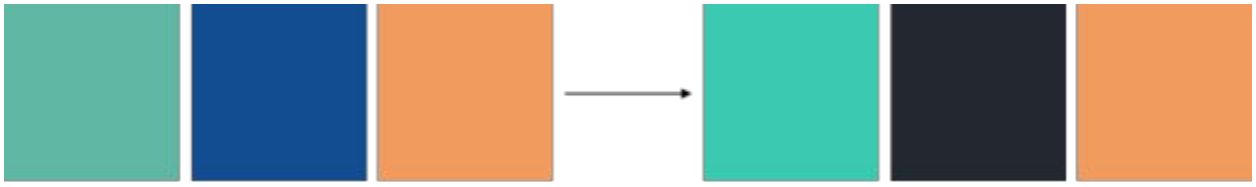

Figure 22: Color schemes of med-fi and hi-fi prototypes, respectively

V. Prototype Implementation

Programming Tools

The prototype was primarily built using the Swift programming language in Xcode integrated development environment. We chose to use Swift for the application since it drops legacy conventions that made the older Objective-C language difficult to develop in. Additionally, Swift more closely matches the structure and paradigms of high-level languages such as Python which we were more familiar with. Additionally, the Interface builder (aka storyboards) feature in Xcode allowed us to lay out each screen and connect them visually through a graphical user interface. This allowed us to create each screen without the use of much code. There is also an Outline view in the Interface Builder, which was helpful in allowing us to modify the layering of elements on each screen (ie. so that a button would not be hidden behind an image).

A difficulty of using Swift was its minimal support of on-screen animations. As a majority of our application is based on animating a marker through a museum tour, we need to effectively string together animations on a single screen. However, in Swift, each screen only supports a single animation because all code runs in parallel. So, each step through the museum tour required a new screen to be created on the Interface Builder. If we had built out more than one tour for this prototype, we would have had hundreds of different screens to coordinate between. Additionally because of lack of animation support, we were unable to incorporate pinch to zoom gestures since each animation had to be hardcoded by pixel movements and changing the zoom requires a new animation (based on the new map size) to be played.

Design Tools

We also designed many elements of the user interface in Sketch and Adobe Illustrator. The buttons with a teal border had to be imported as pictures. If we didn't do this, the buttons would have had to be created programmatically, resulting in iterative guess and checking of the button's location on the screen. Instead, this way we were able to drop the button image graphically on to each screen. Additionally, our tours were pre-drawn and imported as images into Xcode. To programmatically draw tours onto the Cantor Arts Center map, XCode would need better graphical support.

Wizard of Oz and Hard-Coded Data

Our hi-fi prototype utilizes several pieces of hard-coded data, thus creating several Wizard of Oz effects. First the quiz contains 10 pre-selected pieces of art that remain static every time the quiz is presented. However, the order in which these 10 cards are displayed is randomized, giving the illusion of a new quiz each time. The multiple tour options we present to users are also all the same, for the prototype we only built out a single tour. After completing the quiz, the user believes the app performs back-end analysis to construct a "personalized tour," when in reality this tour is hard-coded to be the same as all the others. Similarly, the tours highlight all the same points of interest.

Of note is the fact that for our med-fi prototype, we classified our map navigation as a Wizard of Oz technique in that we were simulating the anticipated location tracking through the museum. However for our hi-fi prototype, we have reclassified this, opting to merely animate the path for the user. Our assumption is that users will be able to successfully navigate the route if we display one step at a time, though this assumption stands to be validated.

Future Improvements

Moving forward, there are a couple key improvements that could be made to our app. As previously mentioned, adding a pan and zoom feature to our map would significantly improve the flexibility on the map interface. Next, our tour options are currently limited. Mapping out several popular tours would add variety and lend legitimacy to our app, and could be presented to all users. Furthermore, instead of having a default "personalized tour" as we currently have, we could develop back-end analysis to truly customize a tour. For a start, we could build a database of 20-30 pieces of art in the museum, each with a few highlighted details. Based on rudimentary analysis of the quiz results, we could select 5-10 points of interest, then draw an optimized route between these points. Finally, our app still could use location tracking abilities. Though the technical degree of difficulty is high, such a feature would make our navigation task drastically more realistic.

VI. Summary

After initial needfinding interviews of a range of Cantor stakeholders, we decided to tackle the issue of museum fatigue by providing a personalized museum experience. Several rounds of prototyping and subsequent user testing led us to our final design. Through a series of Tinder-style questions, a user completes an art preference collection quiz, cumulating in a personalized Cantor tour. We indicate the intended path through the museum, noting specific points of interest. The user then interacts with an image of the piece of art to gain more detailed insights than what the standard museum infrastructure provides. While technical limitations restricted our hi-fi prototype's feature set, we believe CanTour proposes a legitimate use of modern technology to give a higher quality, more enjoyable experience to visitors of Cantor and other art museums worldwide.