P3.2

a. A description of the prototype of your final design idea, using scans or images of your prototype and/or a video, with written elaboration on how the prototype enables user interaction (65 points).

We have chosen the mobile crowdsourcing and navigation app as our final design idea. We have designed a low-fidelity prototype to demonstrate how the app can be used in two usage scenarios. In this section, we first describe the two usage scenarios and provide an overview of the screens in our prototype. We then briefly describe how these different screens are linked together by an indexed state transition diagram. Finally, using the state transition diagram and the prototype, we illustrate the two usage scenarios in detail. A short narrated video of one of the usage scenarios is provided as a supplementary material.

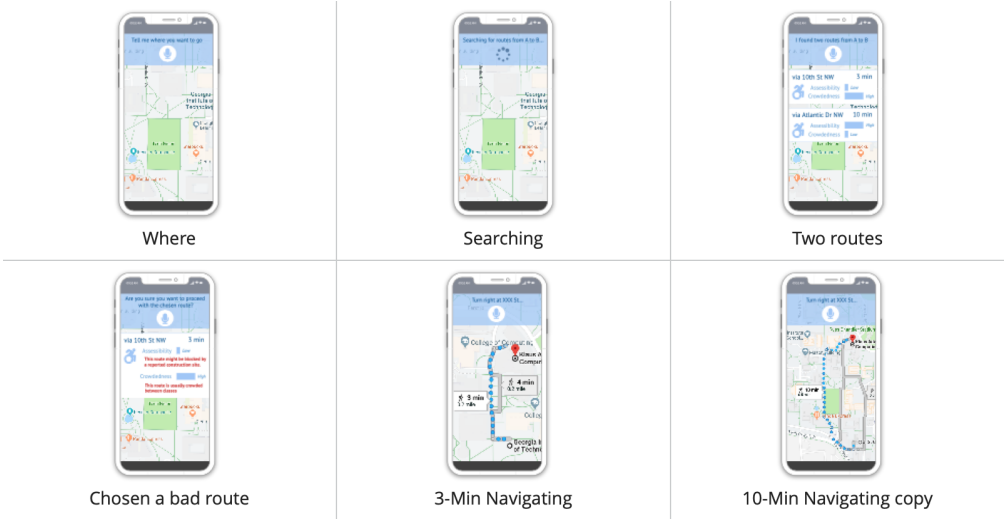
Usage Scenarios

First scenario: Jane is a wheelchair user. It is the first day of the semester. Jane wants to go to a classroom but is unsure about where it is. She asks her friend to drop her off somewhere close to the classroom. As her friend has something to do, she needs to go to the classroom on her own. Luckily, she has our mobile app! Using the app, she searches for possible routes to navigate from where her friend can drop her off near the classroom.

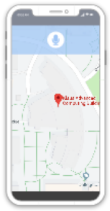
Second scenario: As Jane's first class of the semester finishes, she wants to go to the MARTA station to meet her friend. She wants to request a Stingerette ride again using the mobile app.

Screen Overview

The following are the screens we prepared for the two usage scenarios. There is an index below each screen (e.g., for the first screen, its index is "Where"). These indices will appear again in the state transition diagram to illustrate how one screen transition to another screen.



Elevator



Blank

Next destination

Stingerette

Wanna go?

Navigating Stingerette

Construction

Crowdedness

Alternatives

Open door

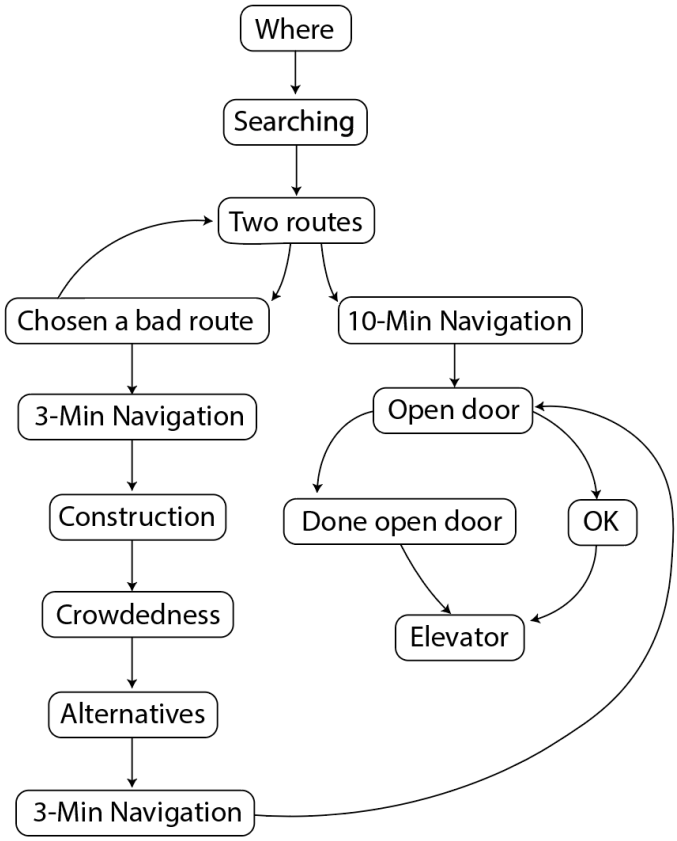
Done open door

OK

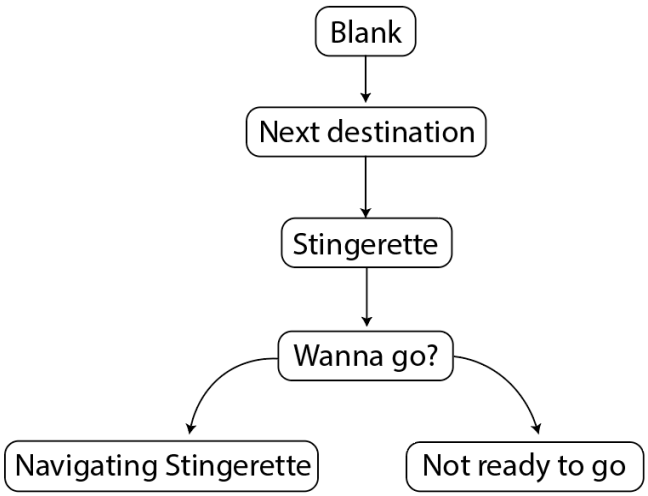
Not ready to go

Indexed State Transition Diagram

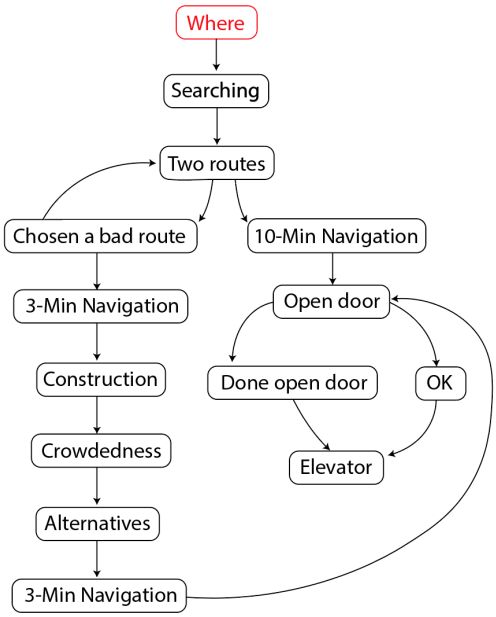
Below is a diagram showing how a screen transitions to another while Jane interacts with the prototype in the first usage scenario. The label of a node corresponds to an index to a screen.

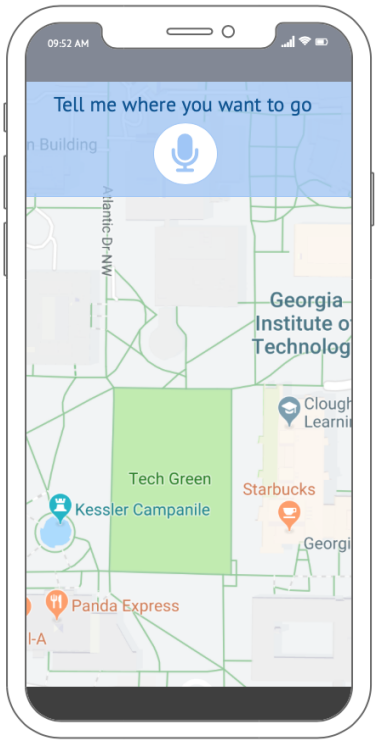


Here is another diagram for the second usage scenario. Again, node labels are screen indices.

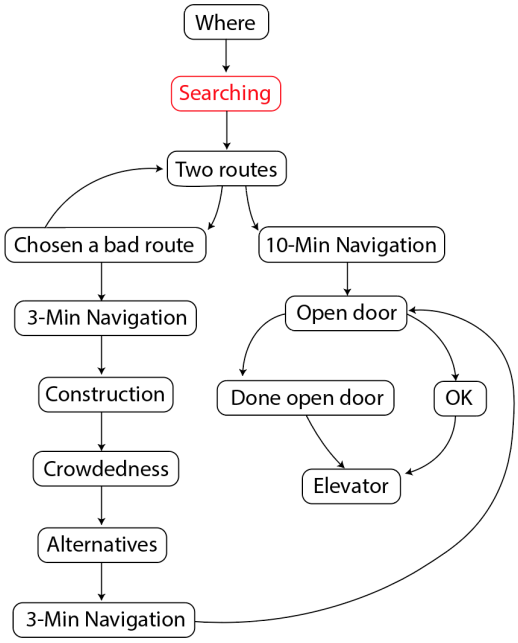


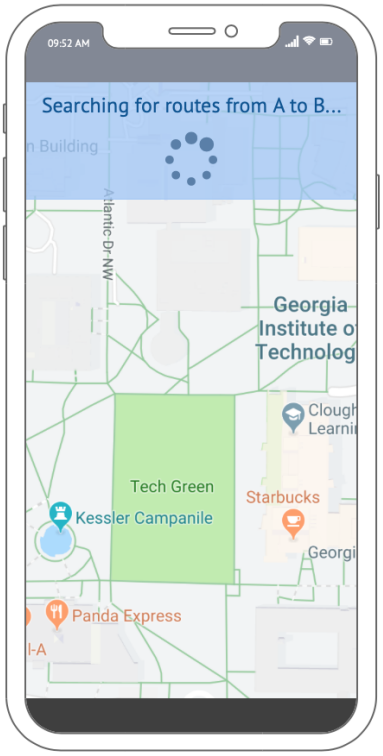
First Usage Scenario Walkthrough



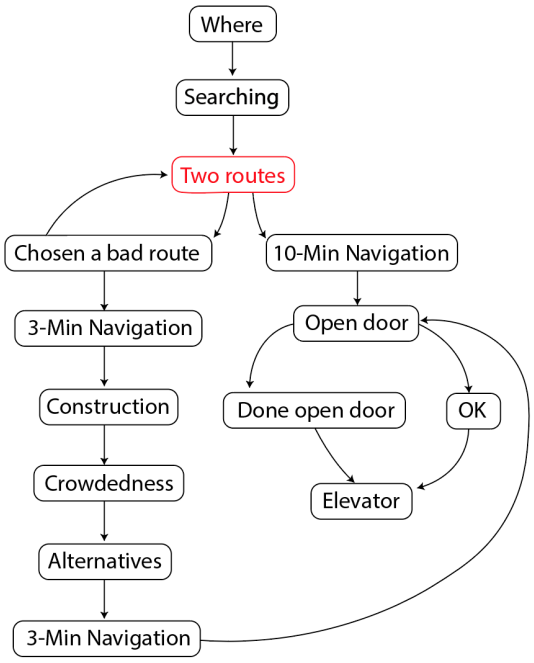


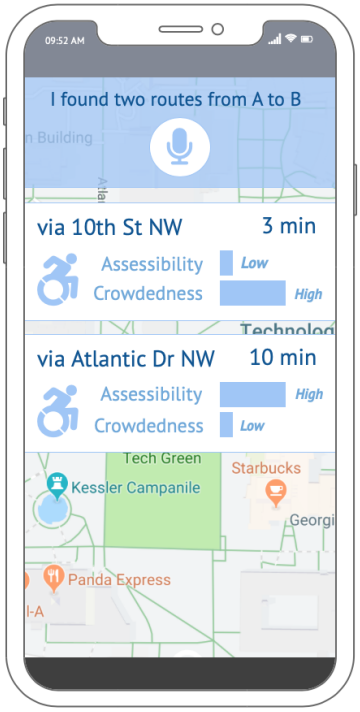
1. Jane opens the app and says “how do you go to Klaus room 2100”?



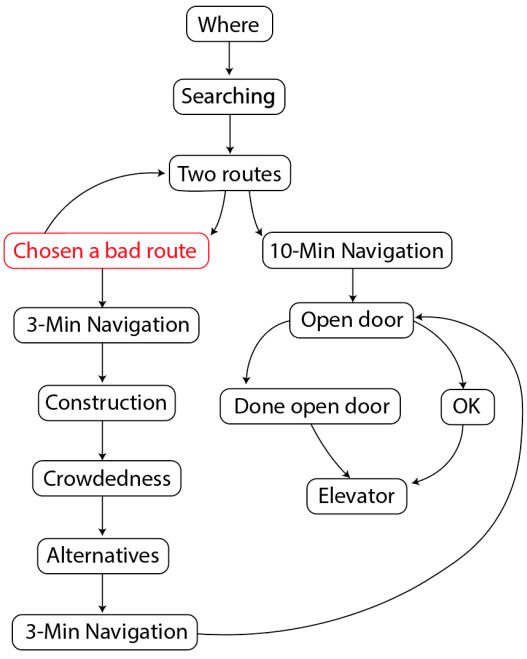


2. The app responds by saying “searching for routes from your location to Klaus”.



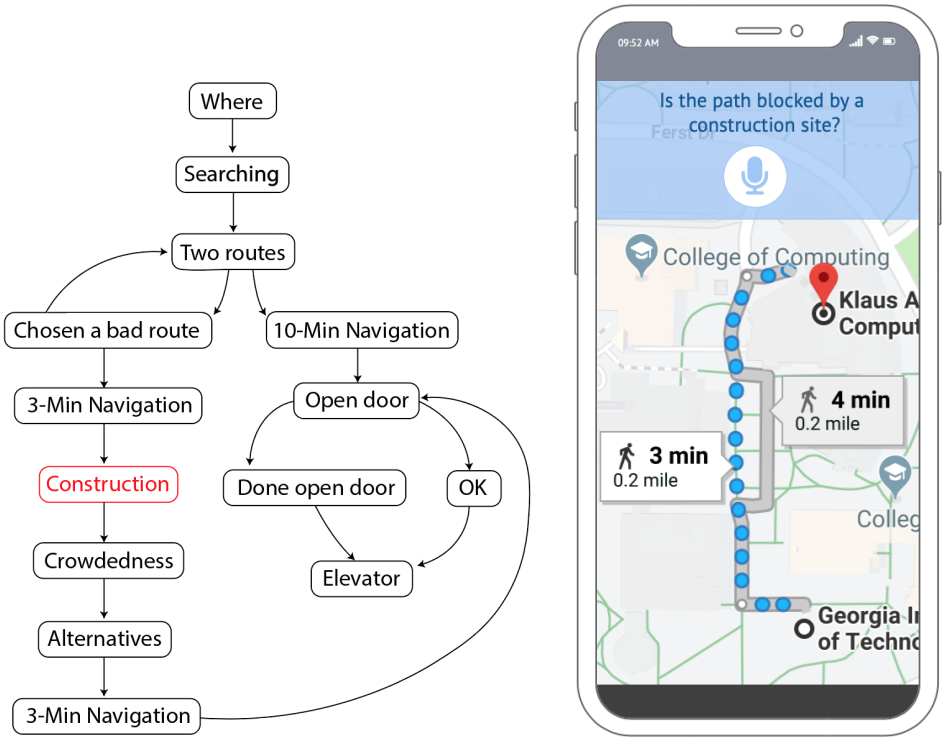


3. The app says “I found two routes from your location to Klaus. The first one takes 3 minutes but may not be wheelchair-accessible. The second one takes 10 minutes and seems to be more reliable.”

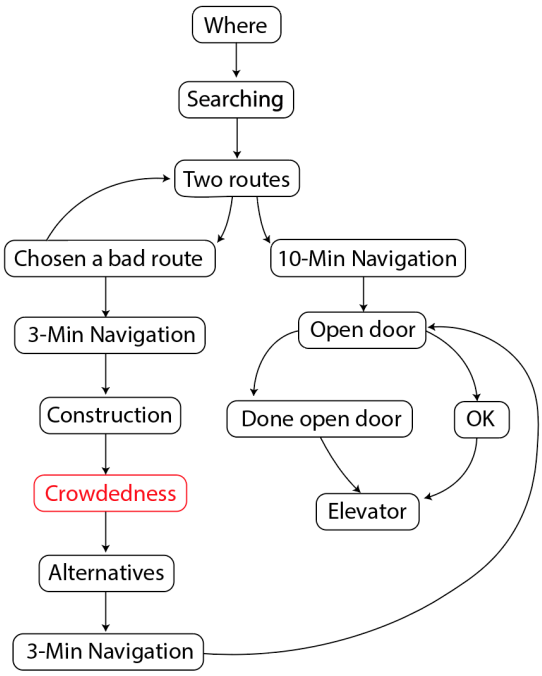


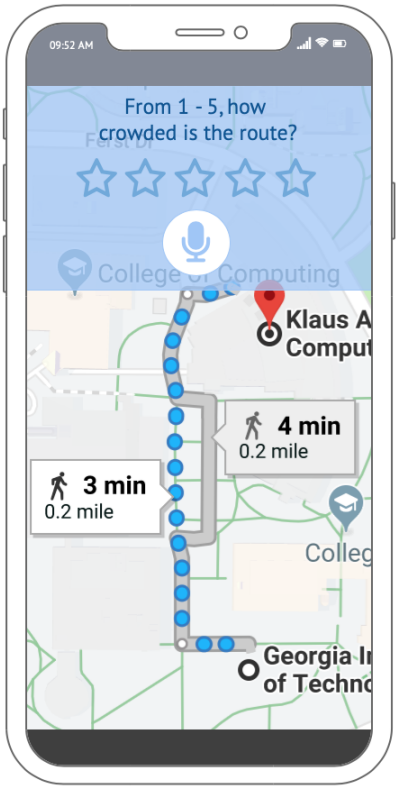
4. Jane says, “The first one seems to be faster. I want to choose the first one”. The app responds and says, “It was reported that a construction site might block the route. Are you sure to proceed?”

5. Jane wheels around by following the instructions provided by the app.

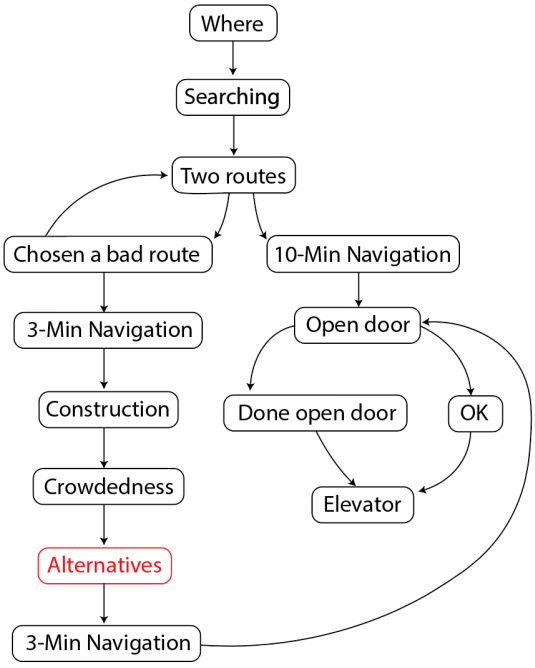


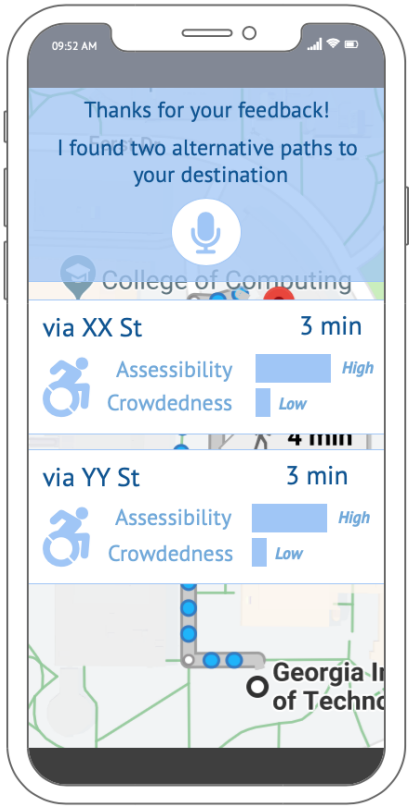
6. As Jane approaches the location where a construction site was reported, the app asks, “is the path blocked by a construction site?” to gather more information about the campus for updating the campus map. Jane does see a blockage and she says yes.



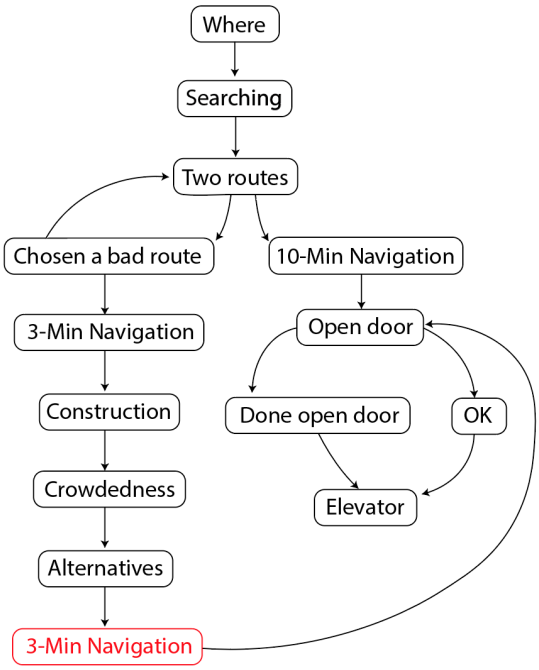


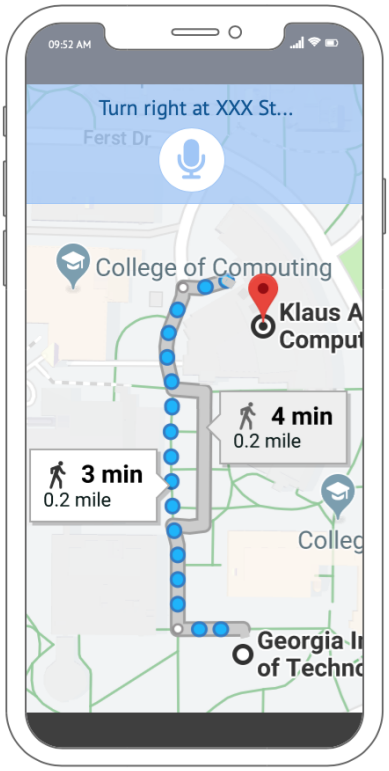
7. The app asks for further information about the current path, in particular, crowdedness.



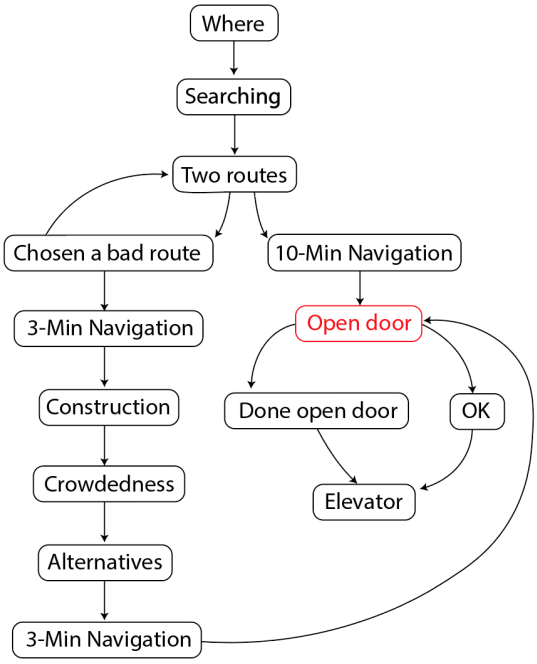


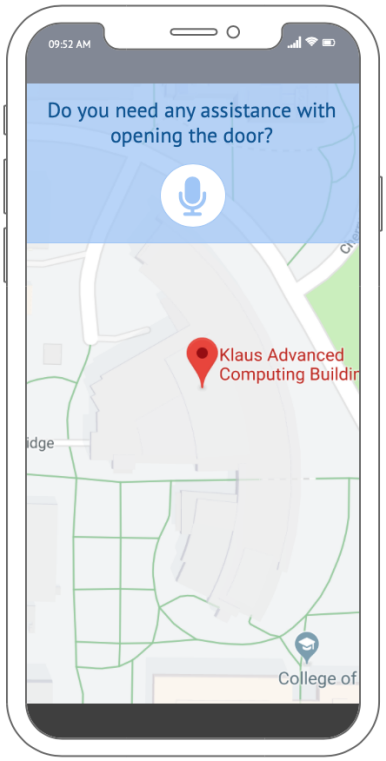
8. The app says, “Thanks for your feedback!” and presents Jane with two alternative paths to her destination. Jane selects the first path with voice.



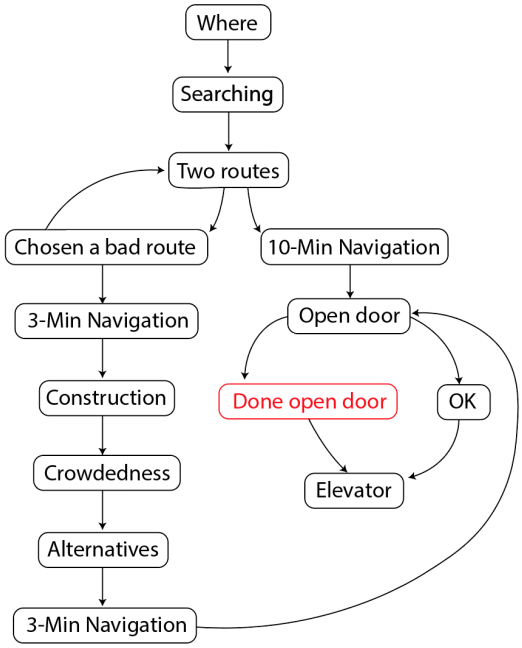


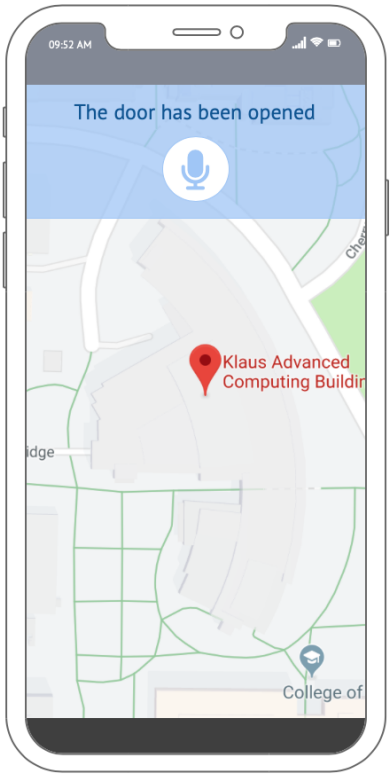
9. Jane continues her journey by following the instructions.



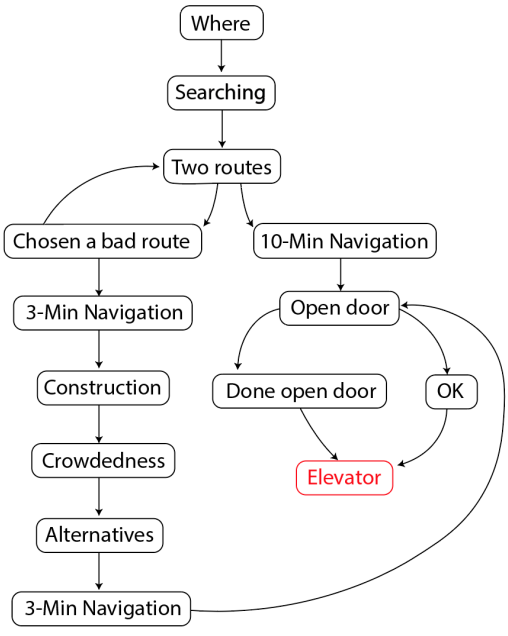


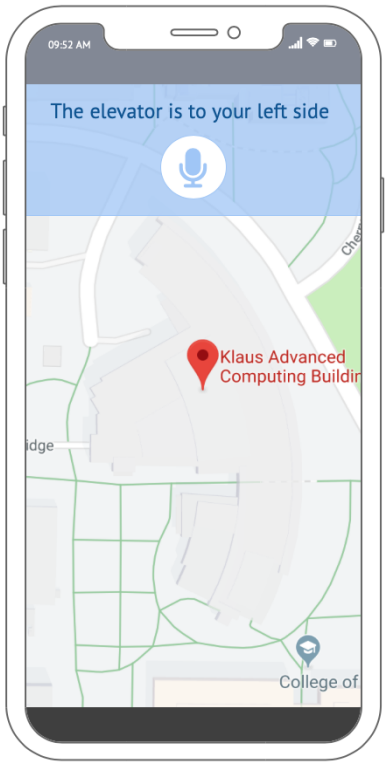
10. As Jane approaches Klaus, the app asks where she needs help with opening the front door. Jane says yes.





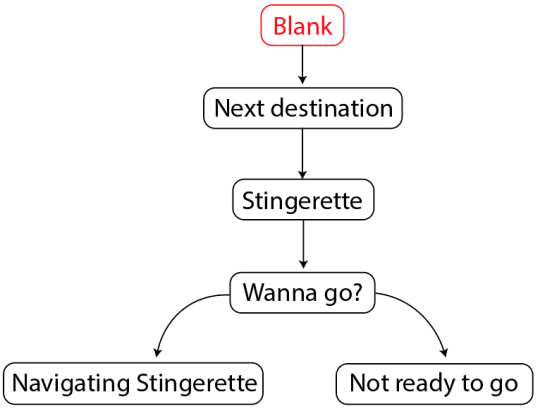
11. The app opens the front door for Jane.

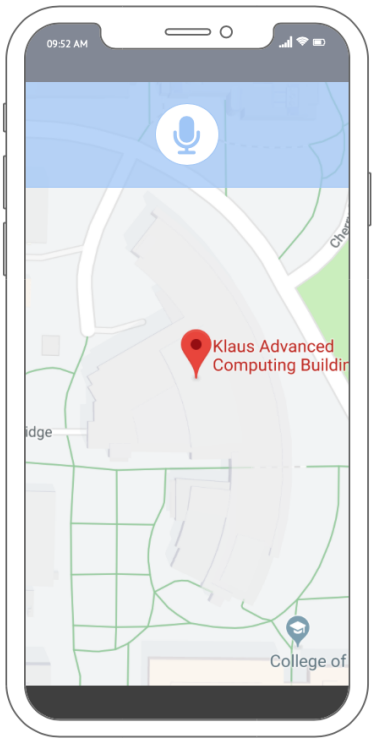




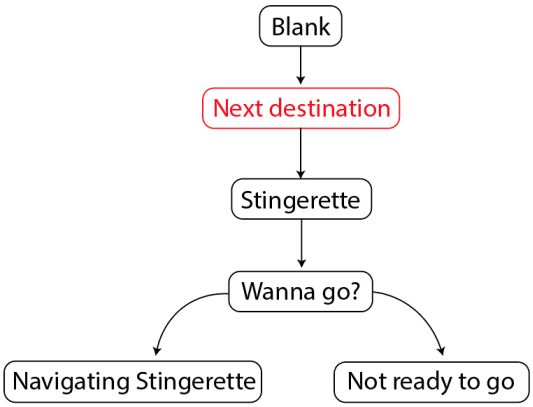
12. Our app mainly focuses on outdoor navigation and provides limited indoor navigation capabilities. As Jane gets into the building, the app guides her to the closest elevator.

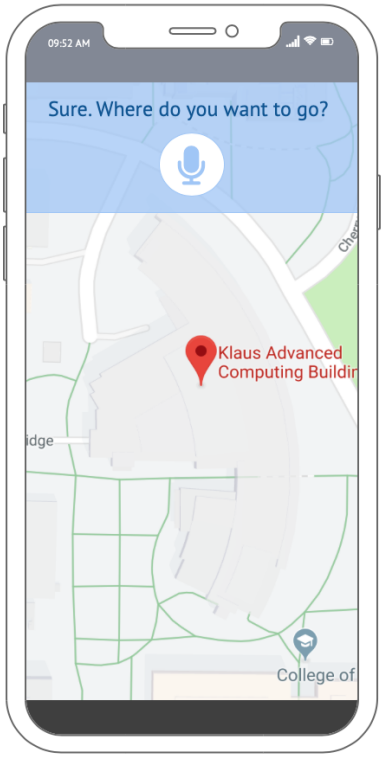
Second Usage Scenario Walkthrough



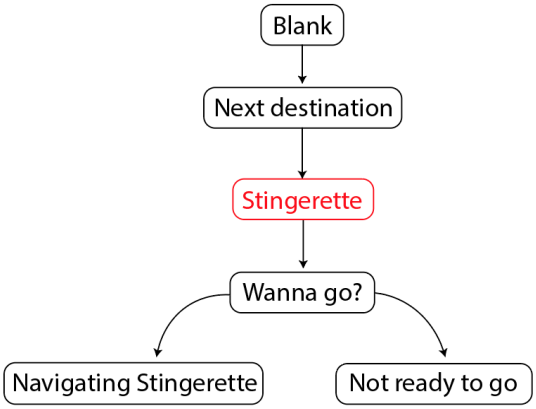


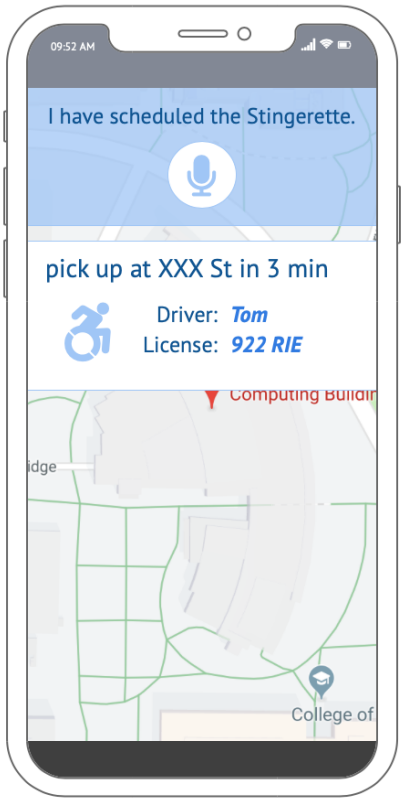
1. As Jane works out of Klaus, she says, “I want to schedule a Stingerette.”



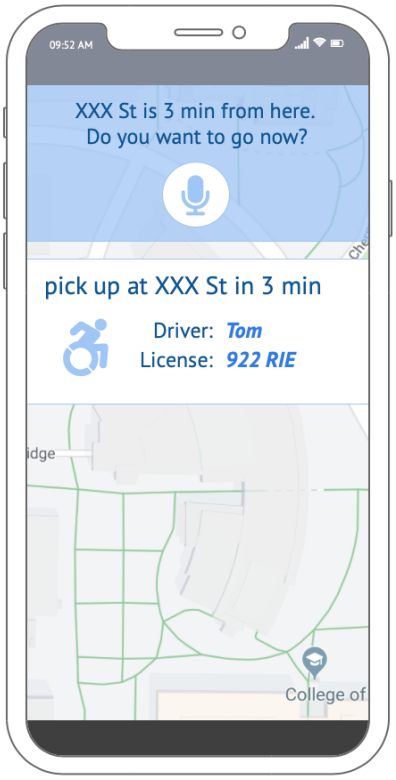


2. The app says, “Sure. Where do you want to go?”

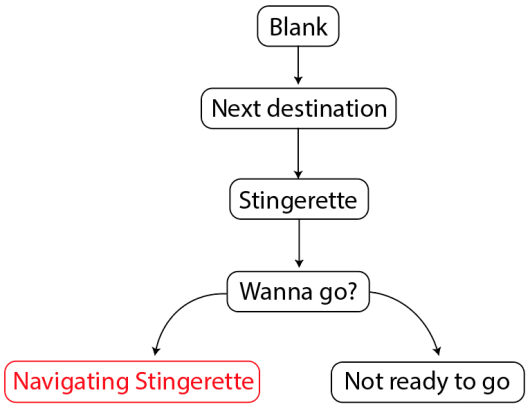


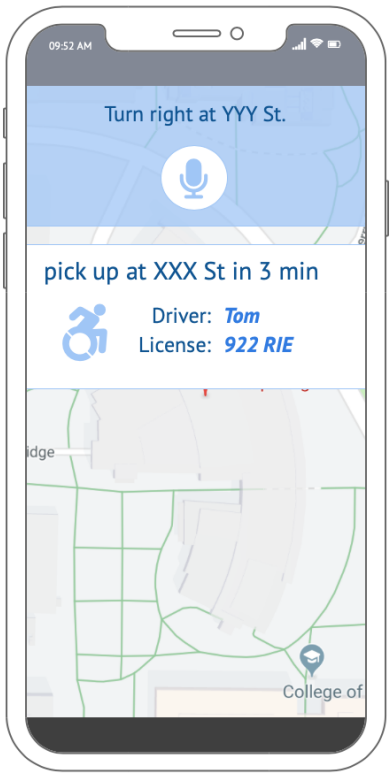


3. The app requests a Stingerette ride for Jane and the driver will pick up Jane at XXX St.



4. The apps asks if Jane wants to go to XXX St to wait for the driver and Jane says yes.





5. The app guides Jane to XXX St.

b. Justification for your choice of prototyping techniques and tools. Use at least one paragraph. (10 points)

We use Balsamiq for creating the low-fidelity prototype. An alternative approach is to sketch the screens on a piece of paper. There are three reasons why we use Balsamiq for prototyping. First, there are a lot of repetitive elements across screens. For instance, the map the mic icon appear in all of the screens. Online prototyping methods allow us to copy and paste these elements across screens, making the prototyping process more rapid. Second, maps are hard to draw but they can be easily copied from Google map. We were afraid that using paper prototypes requires us to spend too much time on sketching the maps. Finally, Balsamiq creates a more realistic look and feel that sketching and can potentially facilitate user testing.

c. Discuss the challenges you faced in detailing the prototype to prepare it for (later) testing. Were there aspects that were difficult to depict? Were there interactions that you wanted to support, but were unable to? Why? Use at least 1 paragraph. (10 points)

The major challenge lies in the fact that the app has a speech interface. It is difficult to use images of the screen to demonstrate how users interact with the app using speech. An another challenge is that users are moving around while they are using the prototype. During user testing, we can only ask participants to imagine the environment around them. For instance, in step 6 of the first scenario, we would probably ask participants to imagine that

there is a construction site that blocks your selected path. This makes the user testing less realistic.

d. A description of the tasks that your prototype is designed to support. Use 1-2 paragraphs. (10 points)

First, our prototype helps students with mobile disabilities (in particular, those in a wheelchair) to navigate the campus. It supports these students to find an wheelchair-friendly route to a destination. It provides various information about a route so that the students can make a well-informed decision about which route to choose. For instance, it tells users about the accessibility of a route (e.g., whether there is a construction site that blocks it and whether the route is hilly).

Second, our prototype allows users to request a Stingerette ride when they want to and provides instructions of how to go to the pick-up location. Third, it prompts users to answer questions about the accessibility of the current location. While this crowdsourcing feature is not a really a task of wheelchair users, it keeps the campus map up-to-date and scaffold the core functionality of the app.

e. A detailed explanation of the design decisions you made, including ones that were intended to address the specific needs of your target users. Use 1-2 paragraphs. Your rationale for the design should bring in a discussion of the needs and/or problems experienced by the target user group you are addressing. (30 points)

From our user study, we found that the main challenge encountered by people with mobile disabilities concerns navigation. We want to focus specifically on students in a wheelchair. There are a couple of factors that make navigating the campus difficult for these students.

First, the original campus map is not up-to-date. New construction sites might block a path and cause students to use another path. The absence of a channel to broadcast this information causes inconvenience to student with mobile disabilities. The crowdsourcing feature of our app makes sure that the campus map is most up-to-date and informs the students whenever a path is blocked. Second, other dynamic factors (e.g., a sudden rain) create difficulties to these students. Imagine that there is a sudden rain and a student in a wheelchair needs to go from one side of the campus to the other side. It is almost impossible for the student to navigate safely in such a poor weather. That is way we allow students to request a Stingerette ride so that they can commute safely even in unpredictable weather condition. Third, our app offers support to help wheelchair users get into a building by automatically opening a door for them. From our interviews, some wheelchair users have difficulties getting into a building even they are ADA compliant. For instance, some wheelchair users are not able to reach the button for opening the door. The door-opening feature allows wheelchair users to get into a building no matter whether the door design complies to accessibility standards. Finally, speech is used as an input modality, because as students wheel around, they may find it difficult to use their hands. This consideration is particularly important for some people (e.g., those with muscular dystrophy) because they may have limited hand controls.