SENG 310 - Milestone 7

Final Report

Smartphone Transport Application:

Is This My Stop?

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1. Problem Description and Motivation

The purpose of this app is to improve the experience of using public transportation. Initially the app focused on alerting users when their stop is close so they don't miss it but over time more features were added to increase the utility of the application. The app now includes multiple useful features such as an indicator of how full the bus is, the option to conveniently save routes, and whether the bus is late, on time, or ahead of schedule.

The motivation for the project is that people have a tendency to get distracted on buses which may lead to them missing their stop. For example if someone is reading a book and not paying attention to the street signs they may get off late. Furthermore, people prefer to not wait at bus stops for a long time and it's frustrating if a bus is full and passes them by. This application seeks to help save people time and ease their frustrations with public transportation.

2. Existing Solutions

There are several apps already available for smartphones that give information on buses. The problem with these apps are:

1. Many are specific to the the transit system used in a particular area. For example MyTransit NYC may have lots of detailed information and a clean UI, but it is only for the transit system in New York City. Google Maps is probably the most ubiquitous as it can provide transit information for virtually anywhere in the world, however beyond departure times and trip duration, it does not have any other features that would be useful for bus riders available in smaller cities like Victoria, BC.
2. Each app has a few useful features but none combine them all. For example the Translink App does give real time location of buses and if they are on schedule and the Can Go app does give people reminders for when to ring the bell to get off the

bus. Since switching between applications isn't practical and may interfere with the accuracy of real time data (since many smartphones don't continue to run apps when they are put in the background), it is useful to have one app that has all the information a passenger may want to know about buses.

Our app is intended to be able work anywhere in the world in the same way, and have all the useful features someone may want when riding the bus. Also our app has a clean UI and is easy to use. Other apps such as the Can Go app are difficult to set up and require downloading large amounts of offline maps.
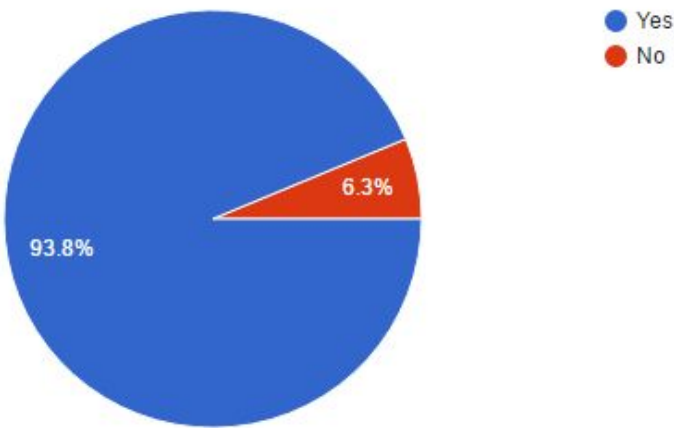
3. Proposed Solution

The original idea was to make a smartphone application which will notify users that their approaching their destination via an alarms. Other features that provide information about the buses were added as the design process progressed.
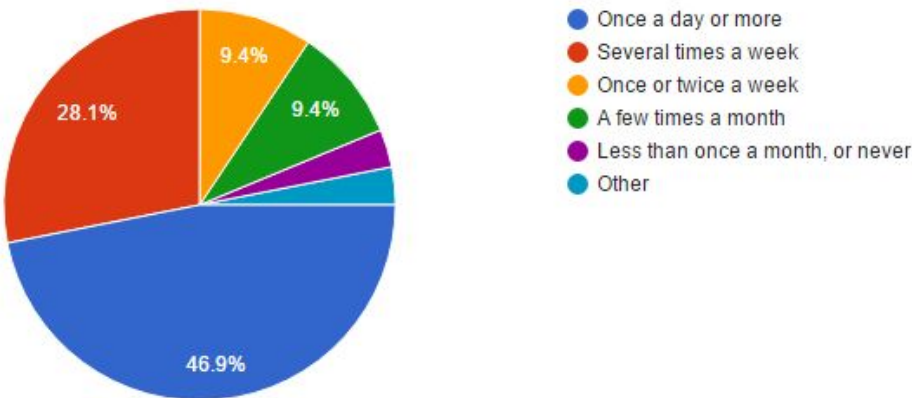
The reason we chose to design for smartphones is that smartphones are conveniently portable and typically have GPS locating and internet access as well as being used by the majority of people. The alarm could make sure that users noticed that the stop was close before they miss their stops if they were reading books, playing games or sleeping.

Our group made a survey going further with this idea. The results from survey showed that some people would benefit from our proposal of a transportation application with alarms. Some selected results from that online survey are included below:
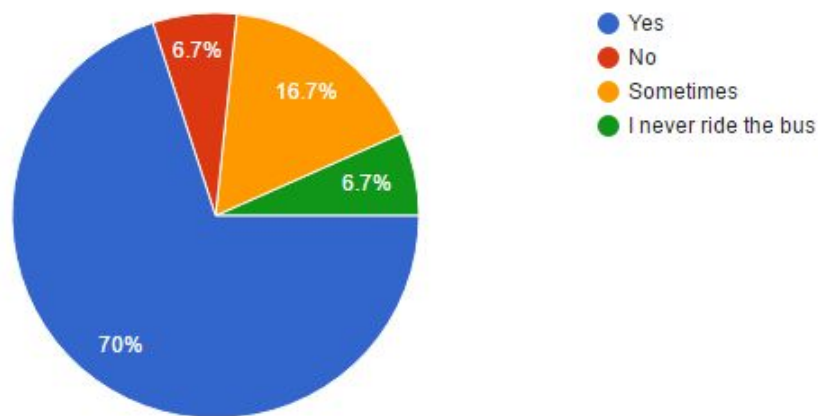
Do you own a smartphone? (32 responses)

- Yes
- No

93.8%

6.3%

On average per month, how often do you use public transit such as buses?
(32 responses)

- Once a day or more
- Several times a week
- Once or twice a week
- A few times a month
- Less than once a month, or never
- Other

9.4%

28.1%

9.4%

46.9%

Do you use your smartphone while on the bus? (30 responses)

- ● Yes
- ● No
- ● Sometimes
- ● I never ride the bus

6.7%
16.7%
6.7%
70%

When was the most recent time you missed your stop? (32 responses)

- ● Today
- ● This month
- ● This year
- ● Can't remember, but does happen to me
- ● Never happened

28.1%
21.9%
6.3%
40.6%
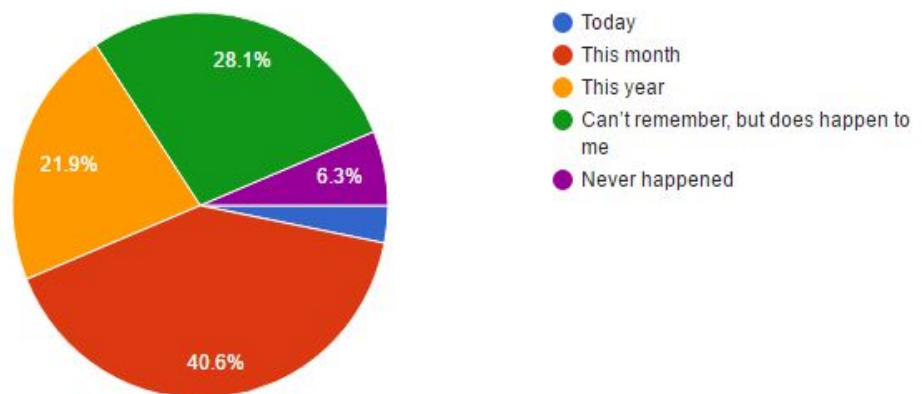
How often are you unable to board a bus you had been waiting for because the bus is full?
(32 responses)

- ● Once a day or more
- ● Several times a week
- ● Once or twice a week
- ● Less than once a week
- ● Never, or less than once a month

25%
28.1%
21.9%
25%
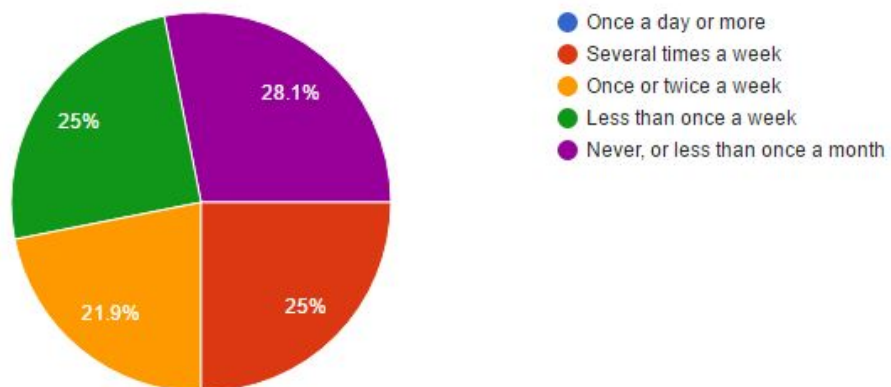
We can see from the charts above, mostly people do take public transportation and majority of them use smartphones on the bus. This represents the target users of our application. What's more, people with experience of missing their stops accounts about 90% of the participants. The survey also indicates the requirements from public transport user that they would benefit from knowing the real-time location and vacancy of the bus.

With this application, users would not need to depend on asking the driver to inform them when to get off or be afraid of getting distracted while riding the bus.

4. Personas

Based on our proposed solution multiple personas were developed. Throughout the design process these personas were adjusted to fit the evolution of the application. The following three personas are the final results of that iterative process.

Persona 1:

Max is a 20 year old engineering student at UVic. He lives downtown with his roommates. He works at Thrifty Foods in Tuscany Village three times a week and he leaves work around midnight. He does not have a car so he takes the bus home after work. He always has his phone with him and often uses while he is waiting for the bus to listen to music and play games. Due to his busy schedule, he doesn't get enough sleep so he cannot help but fall asleep on the bus from time to time. He often misses his stop because of this.

Persona 2:

Angela is a house wife who goes grocery shopping twice every month but does not own a car. She uses the bus to get home and it is often crowded, as she lives on a popular route. Angela misses her stop quite often because she likes to read ebooks on her phone while taking the bus and gets easily distracted. It takes her a while to get all her things to the exit since the bus is crowded so she would appreciate being notified her stop is approaching earlier than most people.

Persona 3:

Akbar is a 25 year old that works downtown but lives near UVic. He has a car that he uses most of the time for transportation and he he often uses mobile apps to help him navigate. Akbar has to pay for parking since his work does not provide him with a parking spot. Akbar takes the bus when he wants to avoid spending money on parking but he hates being late for work so he finds it really inconvenient when the bus is full. He would appreciate knowing if the bus he is planning on taking is going to be full so he could just drive instead and avoid being late.

5. Scenarios & Use Cases

Similar to the constant reiteration of the personas, the corresponding scenarios and use cases were changed many times throughout the designing of this application. Here is the final result:

Scenario 1:

Max walks to the bus stop near his home to take bus to school. He opens the application 'Is This My Stop?' on his smartphone. Max specifies that he wants to be notificated 800 meters before his destination and chooses the alarm volume and vibration level. He taps on the destination in the favourites list and it selects the bus route ending with the closest bus stop. He finds the bus he can take is coming in 8 minutes and has is not full. Max gets on the bus and easily finds a seat and soon falls asleep. The bus moves on and 800m before the stop Max is to get off at, the application sends a notification to his screen, rings and vibrates to alert Max that his stop is near. The alarm wakes Max up. Max move the slider to stop the alarm and gets ready to get off the bus.

Use Case 1:
1. The user opens the application
2. A splash screen is displayed and the user touches to pass it

3. The application shows the center of the map around the user's current location.

4. The user taps "settings" button

5. The application shows the settings screen

6. The user chooses the "Distance" mode and enters 800

7. The user chooses "Meters" mode

8. The user chooses the alarm sound by tapping the "Choose Sound" button

9. The user slides the indicator to set the volume level

10. The user slides the indicator to set the vibration level

11. The user taps on the "Preview" button

12. The application shows a preview of the alarm (complete with sound and vibrations)

13. The user slides to turn off the alarm and taps on the "Save" button

14. The application goes back to the map screen

15. The user chooses the destination from the favourites list

16. The application returns a list of information on the upcoming buses including their arrival time and vacancy status

17. The user taps on one bus route

18. The application returns a new list with if the bus is on-time or early or late and its vacancy status

19. The users tap on one bus

20. The application returns a screen with how long it will take to get to the destination, the notification information and a map with user's real-time location

21. The application rings and vibrates at the specified distance or stop

22. The user slides to turn off the notification

23. The application returns the screen with the real-time location of user's (bus') until reaches the destination

24. The user gets off the bus

25. The application goes back to main screen of the application

26. The user close the app.

Scenario 2:

       Angela is going grocery shopping. As a smartphone owner, she opens the "Is This My Stop?" application to plan her trip. First she enters the address of the grocery store, and push the right angle button. The route that she should take appear in the screen. The application shows that the coming bus is empty, so she decide to take this one. Then, she presses the setting button to set the alarm that make sure she will not miss the stop. Finally, she get into the bus and open a book to read comfortably, because there is no worry about missing the stop, the application will remind her to before the bus arrive the her destination.

Use Case 2:

1. The user opens the application

2. The system presents the splash screen

3. The user taps anywhere on the screen to continue

4. The user enter an address of a destination into the destination bar

5. The user presses the 'Go' button beside the destination bar

6. The system list the trip and the bus information to the user

7. The user selects the Alarm Settings button

8. The system presents various setting options

9. The user sets the alarm to go off a certain number of stops before the destination

10. The user adjusts the volume and vibration settings based on their preferences

11. The user selects the preview button

12. The system displays the alarm screen

13. The user dismisses the alarm

14. The system returns to the Alarm Settings screen

15. The user selects the Save button
16. The system returns to the main display

Scenario 3:

Today is the date that Akbar have to go to work. He is considering if he can take the bus. He hates taking the bus if the bus is full and he doesn't want to late. Therefore, he opens the application which called is the my stop to check which bus is not full and the bus schedule. And he found that there are 3 buses are empty, so he decides to take the closest empty one to take.

Use Case 3:

1. The user opens the application
2. The system presents the splash screen
3. The user taps anywhere on the screen to continue
4. The user enters their destination
5. The system presents a list of possible bus options
6. The user selects the one they prefer
7. The system presents the upcoming schedule for that bus based on the stop closest to the user and information about how full(by percentage) the bus is and whether it is late, on time, or early
8. The user sees the bus they would take is full or late and decides to find an alternate way to get to work

6. Evolution of the prototype

The application went through many changes where features were added and removed while we received feedback and observed users to try to improve the app over time. The following sections outlines that process.

6.1 Example for a Use Case

Our prototype changed dramatically from the low fidelity prototype to the high fidelity prototype. As Max is the persona which corresponds to the main use case, the Max use case is used as an example:

For the low fidelity prototype, Max opens the application and taps the 'Settings' button (on Figure 1.1) to set up the alarm rings on 1 stops before school, the ring bell and the vibration(on Figure 1.5) and confirm. Then Max enters in the address of his school and taps on 'Go' button(on Figure 1.1). Max chooses the route and stop that he wants to take and get off at. Max gets on the bus and falls asleep. He is woken up a stop before school. Max reaches school without missing the stop.

For the higher fidelity prototype, Max almost does the same steps to go to school without being late, but he does not need to enter the whole address of his destination, which is his school. Max just needs to enter a part of the address, the system will search for probable places for Max can choose from (on Figure 2.3 and Figure 2.4). It will save Max time.

For the high fidelity prototype, Max opens the application. He taps the 'Settings' button then chooses the stop mode of alarm and enter '2' to set the alarm ring 2 stops before school. Max scrolls down and sets up the alarm bell, volume and the level of vibration then taps on 'preview' button. The application shows the alarm screen when it comes to 2 stops before destination. Max slides to close the alarm screen and sets up the capacity alarm to 95% where the default value is 90%. Then Max changes the notification symbol by taping 'choose image' button and taps the 'Save' button to save all of the settings. The system goes back to the main screen again. When Max taps on the input box of destination for entering the destination, there is a favourite list with some addresses Max

went to and added into the list. Max chooses the address of school and tap the black triangle button. A list of bus route pops up from the bottom. Max chooses the first route and the most recent bus which is on-time. The system shows a screen with the route map with where Max is and the time to the destination. Max gets on the bus and falls asleep quickly and is woken up by the alarm 2 stops before destination. Then the application shows a map where bus is on the route in real-time. Max reaches school without being late.

Above are the use cases of Max, we can see the evaluation from three different use cases with the same persona clearly. Furthermore, below are the specific evaluated elements we edited on our project:

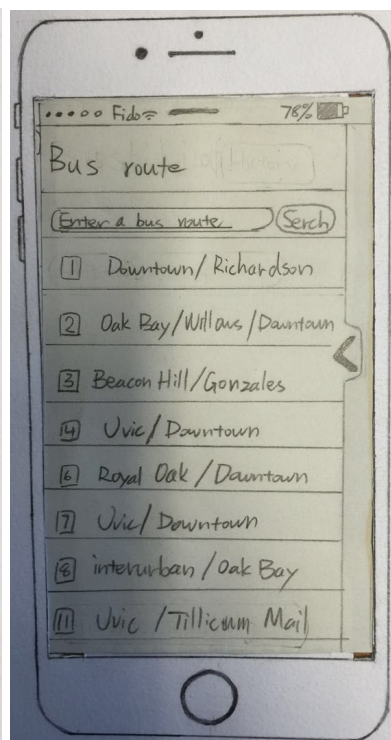- **Low Fidelity Prototype:**
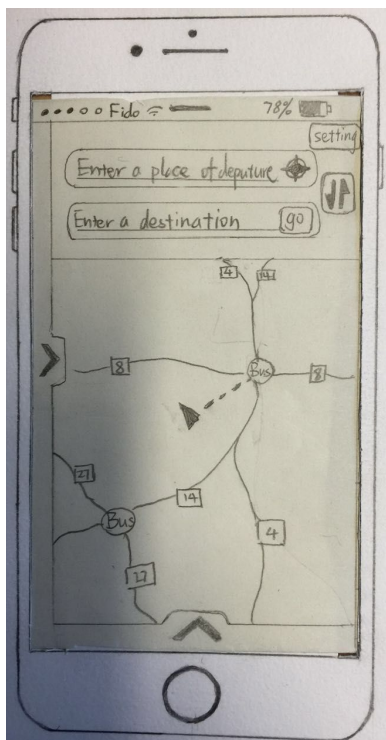
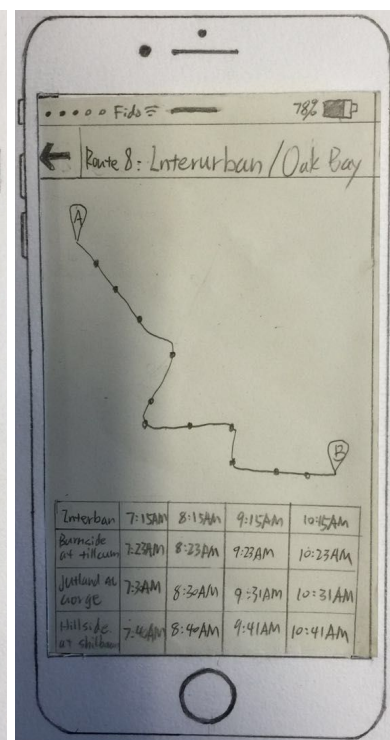Figure 1.1   Figure 1.2   Figure 1.3

Above are some screens of our low fidelity prototype, we made a paper prototype for the low fidelity prototype first. We can see from Figure 1.1, our application holds two

lists where one is on the left side and another is on the bottom of the screen. The list on the left side is the reference buses' schedule (see Figure 1.2 and 1.3) which is used to make a travel plan. It was removed from the application based on the result from peer review in high fidelity prototype. The bus vacancy status function was popular among those interviewed which encouraged us to include it in future prototypes.
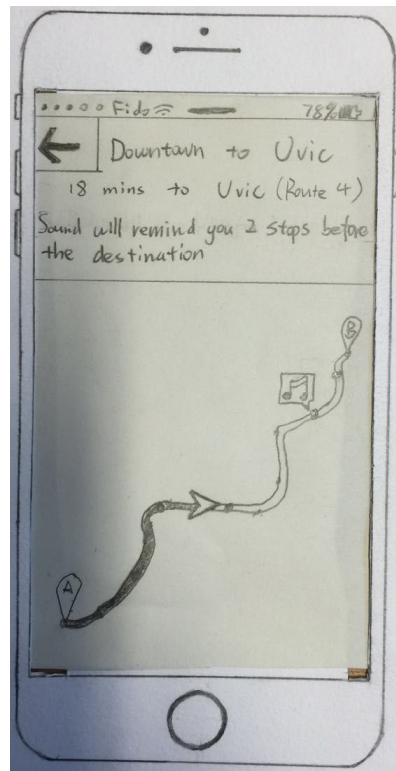

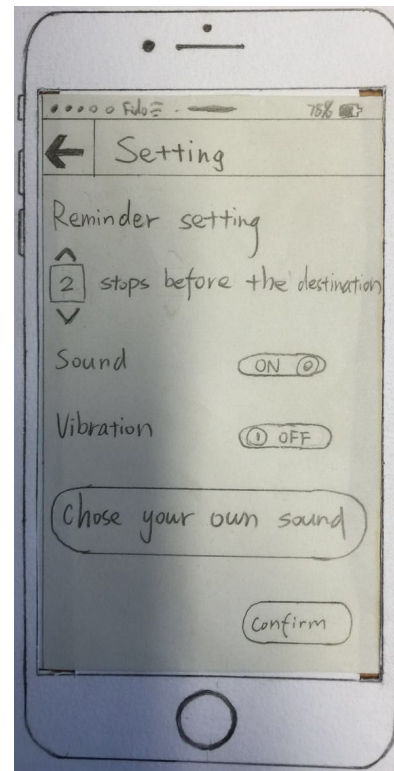Figure 1.4   Figure 1.5

In Figure 1.4, the map and the bus route were ambiguous for users to determine the bus stop left. To solve this problem, we change the symbols on map, such as bus stop, start and destination. We realized that the feedback of our application was not complete and clear enough after the peer review, so we add more feedback in the Medium fidelity prototype.

- **Medium Fidelity Prototype:**

The medium fidelity prototype of our project was made usign Balsamiq. In this prototype, we improve the feedback of searching reference bus schedule and entering destinations.

Figure 2.1   Figure 2.2

As Figure 2.1 and Figure 2.2 show, when the user wants to find out the route of a specific bus and already know its route number, users could enter the bus number and easily find it. When users enter their destination, they just need to enter a part of the destination and the system will show the probable places for users to choose from (see Figure 2.3 and 2.4). We added these screen based on the feedback from peer reviews that said our low fidelity prototype lacked feedback to users.

Figure 2.3	Figure 2.4

- **High fidelity prototype:**

　　We made the largest change on our application in high fidelity prototype. Following are those big changes with some schema which are significant changes but missed in the video demo:

- Removed the left sidebar with the reference bus schedule (see Figure 3.1)
- Added a feature about favourite list of destination with following functions (note: the Favourites List is accessible on the prototype by clicking the 'Enter Destination' bar but in the actual app would appear automatically when that text bar is selected):
  - Added routes to favourite list (see Figure 3.3)
  - Deleted routes from favourite list (see Figure 3.2)
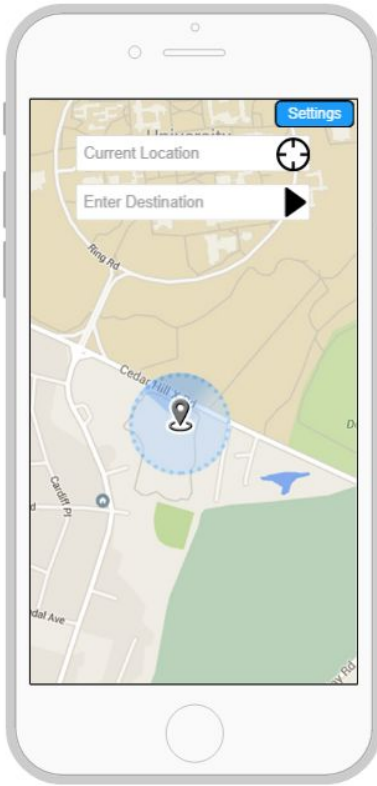
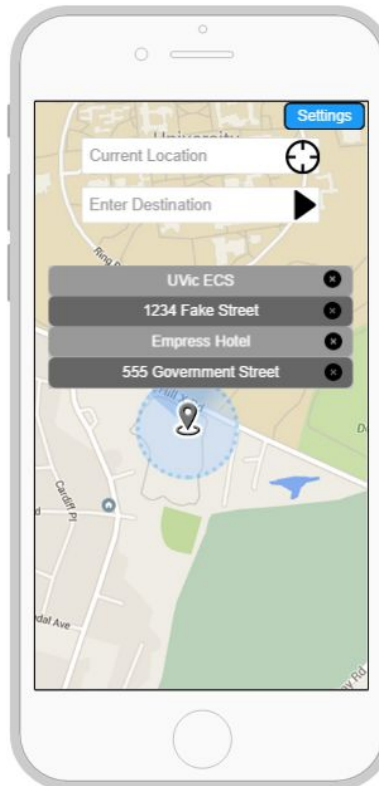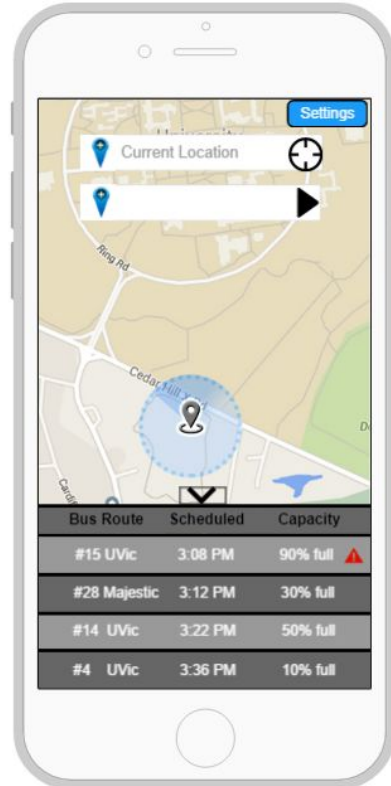Figure 3.1   Figure 3.2   Figure 3.3

- Added a feature that says if the bus would be early, on time or late
- Added the feature about capacity alarm
- Improved the settings page:
    - Added feature that allows users increase or reduce the level of vibration
    - Added two modes of alarm time:
        - Set the alarm rings on X number of stops before the destination
        - Set the alarm to ring a set distance before the destination
    - Added the capacity alarm setting
    - Added the setting of notification symbol
- Added the dot lines indicate the route on foot to and from bus stops
- Added the map of location after alarm before the destination

6.2 Prototype Evaluations & Findings

We evaluated the low fidelity prototype through peer review. It was basically reviewing the application from the perspective of developers. We found that our application needed extra functionality to keep the user, some of the existing features like "choosing your destination stop" did not have enough feedback indicating the current system status of the interface. From the heuristic evaluation, visibility of system status was not clear to the user. In some cases, users were not sure whether the schedule interface was in real-time. Some but not all pages had a heading at the top to indicate a context for the user.. For example "Route list" did but the setting page did not. Also labels could have slightly different wording, for example "list route" or "route list". It's unclear what the labels "empty" and "full" refer to. Problems between system and real world include:

- Page with routes on it could have a symbol to represent the notification clearer (some sort of alarm symbol could be used to convey something will grab the user's attention).
- Wordings like the use of the word "route" with "stop" or "alarm".

We observed that there were User Control and Freedom issues like clicking on the back button will not exactly send them back to the previous page, that leads to an unstable system status undetermined by original use cases. In the cognitive walkthrough, it is mainly focused on the observation of user intentions on each step of the tasks; we observed user trying to find "history" functionality which is not included in our application. And our application lacked visual representation of real-time buses moving.

6.3 How the evaluation findings affected the prototype

After gathering all our findings, more changes were made to the prototypes than the personas and scenarios. We addressed these three main problems and made improvements in our prototype.

- There is no real time location of the bus
- Displaying just full or empty for the status of the bus is too vague
- Only saved routes are shown but there is no history of all searched routes

During the evaluation of the low fidelity prototype, it was hard to tell where exactly the bus is on the road. This feature is very important so that people do not end up going out to wait for the bus, only to realize it either came too early or it is going to be late as the paper schedule only gives an estimate of the arrival without taking into consideration traffic or other factors. To fix this problem, in the high fidelity prototype we added a feature on the map that shows the bus and moves as the bus moves so even if the schedule says the bus would arrive in 5 minutes and on the map the bus is still far away, users can go out at a more convenient time and don't have to go and wait for too long . Also in the high fidelity prototype, instead of just displaying "full" or "empty" as the status of the bus we used percentages, 0% being empty and 100% being full. Anything between those figures give users an idea of how full or empty the bus actually is. Finally, the low fidelity prototype did not have a feature that allowed users see the history of past searched locations. This feature is very important as one might want to revisit a place for various reasons but might not want to have it as part of their destination. In the high fidelity prototype this feature allows people to easily select from a list of previous destinations.
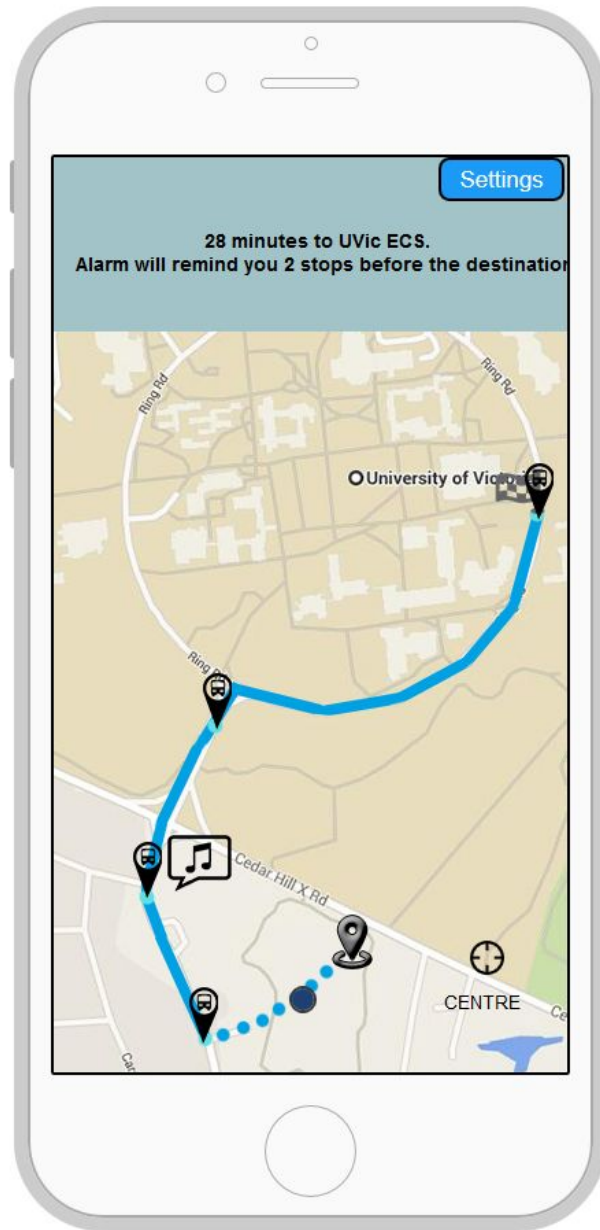
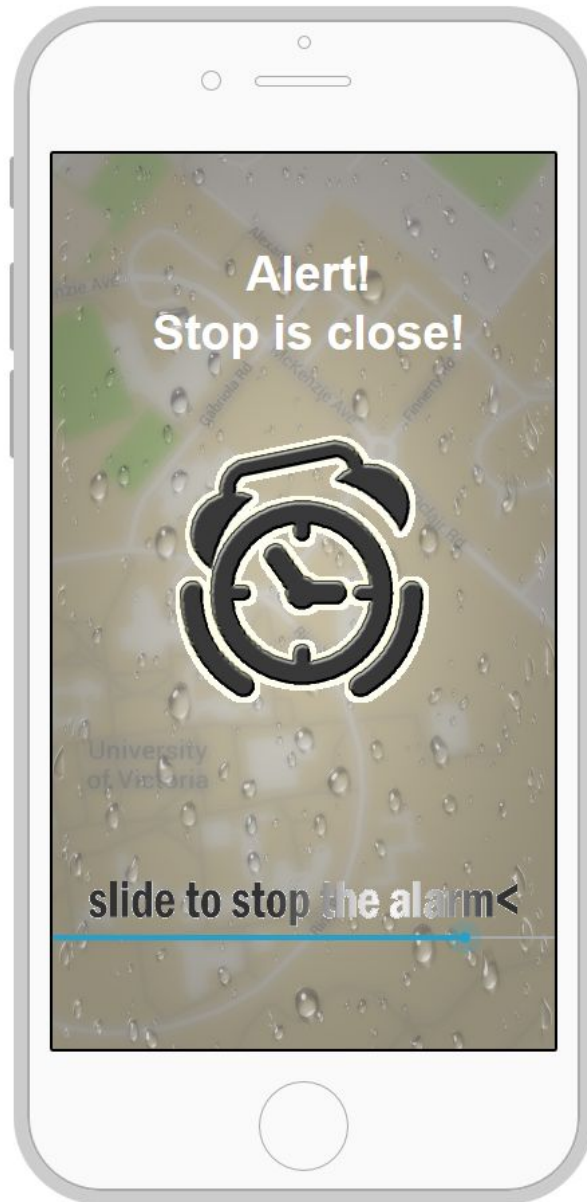# 7. High Fidelity Prototype
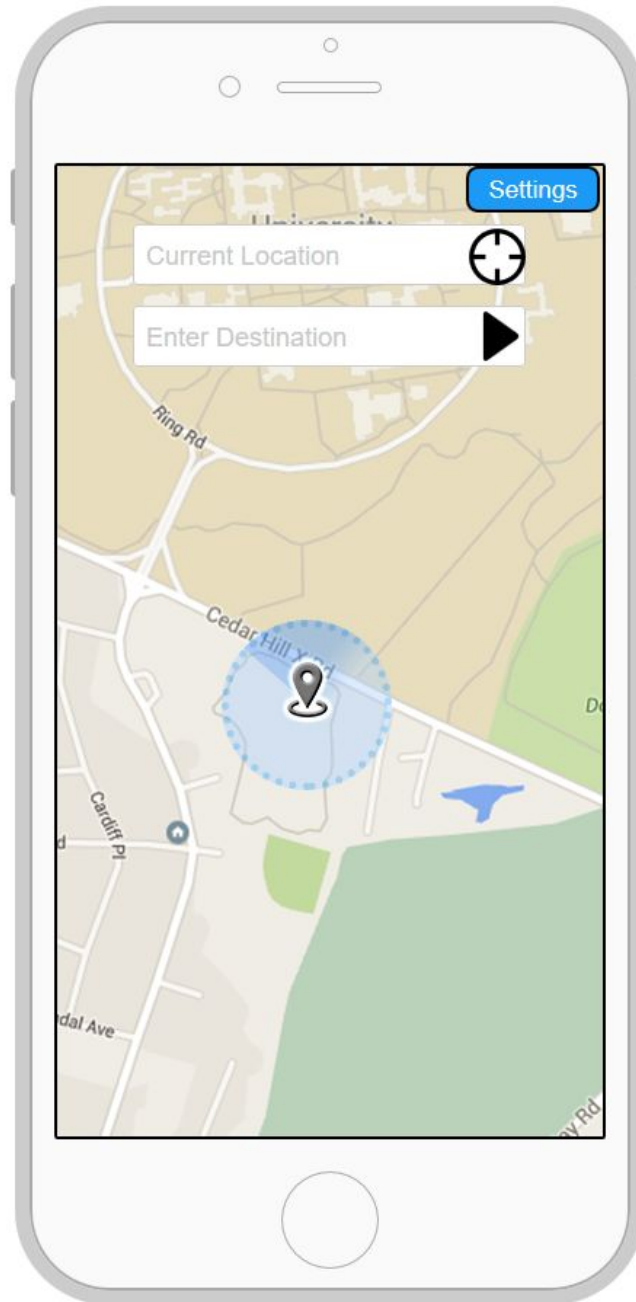
1. Main screen where users can enter where they are coming from and where they are trying to go.
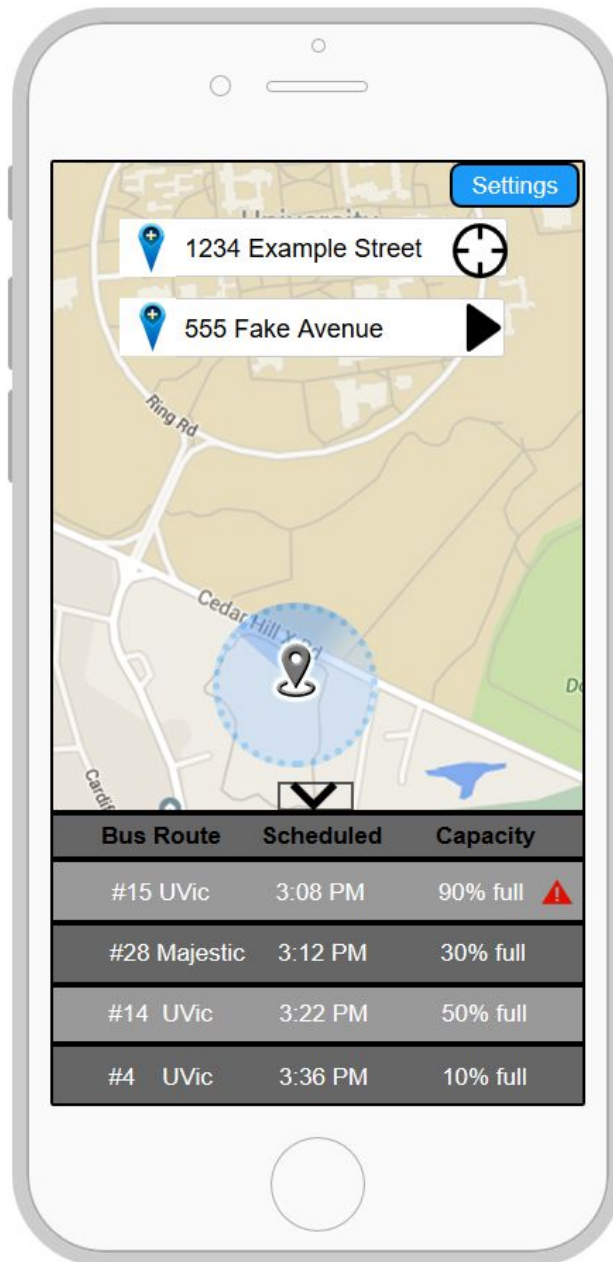
2. Example of available bus routes for given locations.

3. Showing the current location on a map with a notifications of how much longer until the destination.

4. The alarm screen that displays when the stop to get off is close.

8. Future Work

Some changes that would likely be made if this project were to continue would include changing the colour scheme to have less grey in it as some users mentioned that they found it made the app appear dull and not eye-catching. The idea of making it possible

for the app to give the user a route where they would be required to take multiple buses was suggested too late in the process to implement but that feature would likely be worked into future prototypes to improve the usefulness of the app. Also some additional features could be added regarding the vacancy of the bus. For example, if a person is riding their bike they would need to store it on the rack on the front of the bus. These racks can only hold two bikes and sometimes bikers have to wait for another bus when the rack is full. The app could have an indicator if there is still a free rack. Also certain seats at the front of the bus are designated for wheelchairs and people with baby strollers. If these are full, some people requiring them would not be able to get on the bus even if the app had shown the bus was not at capacity. The app could display additional information to let riders know if there is space for wheelchairs or baby strollers.

9. Lessons Learned

One of the most challenging parts was making sure all team members were on the same page. For the medium fidelity prototype multiple members were responsible for making one or two pages each and it resulted in some overlapping due to miscommunications. Everyone had a slightly different idea of the app and various conflicting features were added. The prototype needed to be redone to restore consistency. For example, some features were added with the idea that the user didn't have to enter the starting location or destination and that the app would simply show a list of buses in the area. Other features assumed the user would have to select a starting and ending location. Many features and slides were removed to fix the problems. Essentially, another iteration was done. This could have been avoided if we had more preliminary meetings and group discussions before creating the prototype. We should have focused more on the lo-fi prototype.

We used Proto.io for the hi-fi prototype. While it claimed to support collaboration with multiple people, we found this was not really the case. If two people tried making changes at the same time conflicts would arise and changes were lost. Proto.io may not

have been the best option and if we were to do this again we may have used a different prototyping tool.

Also the project evolved over time. The final product had more features than anyone initially intended (even after removing the ones that caused inconsistencies). It may have been naive to think the initial vision of what the product would like would be close to the end project; it's somewhat expected for ideas to change and that's what iterations are for.

10. Required links

Final Prototype: https://pr.to/GFK94R/
Video : https://youtu.be/44txFcZTddI