

OnePaceAway: Pedestrian Navigation for OneBusAway

Team Members/Role:

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Problem and Solution Overview

OneBusAway is a useful application providing real-time bus transit information. It can display bus stops on a map, approximate bus arrival times for a given stop, and display a full schedule for specific routes. Users can also choose the nearest bus stop on the desired route and find out when their bus is coming. Although this application does a great job giving transit information to users, it does not actually help users to know whether or not they can catch their bus. OnePaceAway, an addition to OneBusAway, is a solution that provides real-time estimates of how long it would take for users to travel to a bus stop from a location as well as how fast they must travel in order to stay on schedule - a navigation aid for pedestrian riders.

Task Analysis

1. *Who is going to use the system?*

Users of our system are intended to be both frequent and occasional bus riders who use the OneBusAway. In particular, our system is especially targeted towards those who are always in a rush to catch a bus and those who may be unfamiliar with an area and do not know how to get to their stop. Because the purpose of our application is to provide real-time pacing information to pedestrians out in the streets, we are primarily targeting users of OneBusAway's smartphone application.

2. *What tasks do they now perform?*

Currently, users check the schedule in OneBusAway to find out when their bus is coming and how long they must wait at the bus stop. Most of our contextual inquiry participants, including Jenny and Natassia, used OneBusAway only at the bus stop to see how long they needed to wait for their bus. When leaving home, they check the schedule either on OneBusAway or through the metro website and estimate how long it will take for them to get to their bus stop on time (taking into account a variety of other factors).

3. *What tasks are desired?*

Desired tasks include but are not limited to: finding a route to a bus stop from a user's current position, adjusting this route as necessary while the user travels, getting an estimate of how long it will take to travel to the stop at a certain pace, and knowing whether a user needs to quicken their pace in order to catch their bus.

4. How are the tasks learned?

Tasks may be learned in several ways: from an intuitive sense from the user-friendly interface of OneBusAway, from previous experience using the app, and from searching for tutorials and/or guides online for OneBusAway. Jenny, Gary, and Natassia all stated that they liked how simple and intuitive it was to use the OneBusAway interface and that there was little to no learning curve involved when they were learning to use it.

5. Where are the tasks performed?

These tasks are performed wherever the user is on foot and planning to go catch a bus (ex. before leaving home, at the bus stop, or on the streets) and when they wish to know how fast they must walk to reach their bus stop.

6. What's the relationship between customer & data?

Data conveyed to customers in our application will help them travel to their bus stop as well as help them catch their bus.

7. What other tools does the customer have?

Customers have the physical timetable schedule posted on the bus stops, as well as a paper brochure and web form of the same schedule. When used in conjunction with their own estimates of walking speeds and the condition with which they're walking, customers can manually do the things that OnePaceAway will ideally automate.

8. How do customers communicate with each other?

Given the nature of the OneBusAway application, users will not need to communicate with one another regarding their tasks. However, it is possible and likely that users will communicate over how to do certain things on the app, to verify they're interacting with the app in the way they should, etc.

9. How often are the tasks performed?

Tasks will be performed as often as a bus rider on foot needs to catch their bus. For some users this will be a daily routine, for others this will be an occasional occurrence.

10. What are the time constraints on the tasks?

The only time constraint placed upon users is the amount of time before their desired bus arrives at targeted bus stop. This constraint may be affected by adverse weather conditions and heavy traffic congestion.

11. What happens when things go wrong?

Things can go wrong in two ways with our application:

- The user travels off the path suggested by OnePaceAway. In this situation, the application will inform the user that they have travelled off track, then recalculate a new path to the bus stop from the user's new position.

- The user misses the bus. In this situation, the user can either continue on to the stop and wait for the next bus or attempt to find an alternate route. OnePaceAway will support functionality for the former choice, but the latter choice is beyond the scope of our solution and it will be the responsibility of the user to figure out their next course of action.

Current Tasks

Easy Task - View navigation information to bus stop

Jessica is an 18 year old freshman attending the University of Washington. She is trying to get home by bus after her first day of class and is unfamiliar with the campus. Furthermore, sudden inclement weather has settled and the roads are completely covered in snow. She knows that the particular route that she will take to go home has a bus passing by the stop every 10 minutes, so time is not an issue. Although OneBusAway tells her where her stop is, she does not know how to get there. She also wants to minimize her wait time at the bus stop to minimize exposure to the cold weather.

Moderate Task - Adjust pace as necessary to catch a bus

George is a 36 year old gentleman wishing to get home after a long day at work at a Red Square concession stand. He needs to take the bus to King Street Station so that he can take the Sounder train home. Although his bus arrives at the stop in 10 minutes, George doesn't want to close early and risk losing sales. He stays 5 more minutes to serve the last-minute customers, then quickly closes shop. Knowing that he has 5 minutes left to get to his stop, George wonders if he can make it in time to catch his bus and, if so, how fast he must travel in order to do so.

Hard Task - Dynamically adjust path estimate to bus stop

Jack is a 52 year old UW professor. Today, he has plans to meet with a friend in a neighboring city, which he will travel to by bus. Jack does not ride the bus often, and his knowledge of nearby bus stops is extremely limited. Before leaving his office, Jack uses OneBusAway to find his bus stop. When walking, he finds himself lost and definitely not where his bus stop is supposed to be. He needs to reorient himself and locate where his bus stop actually is.

Storyboards

Design #1 - Moving Pacer

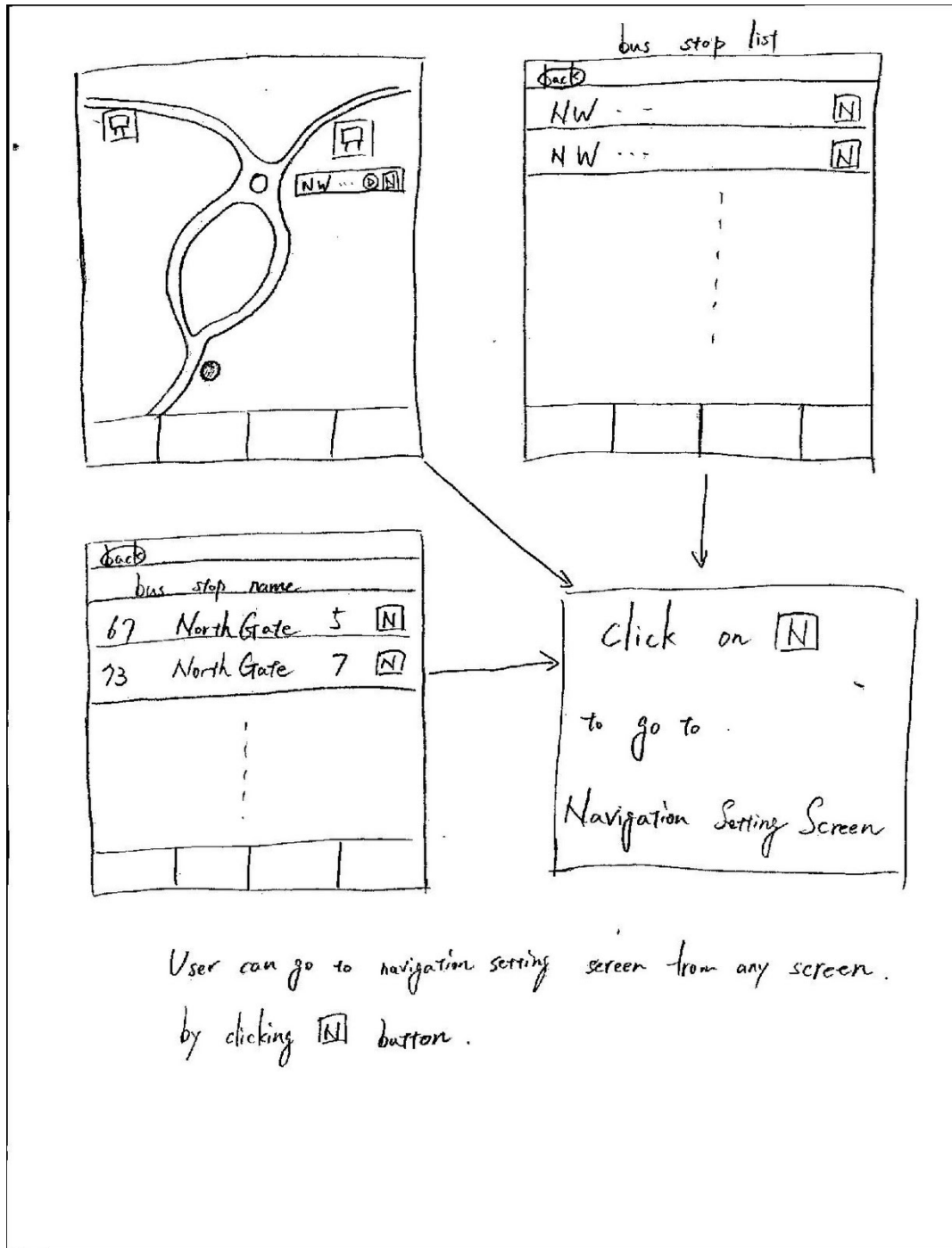
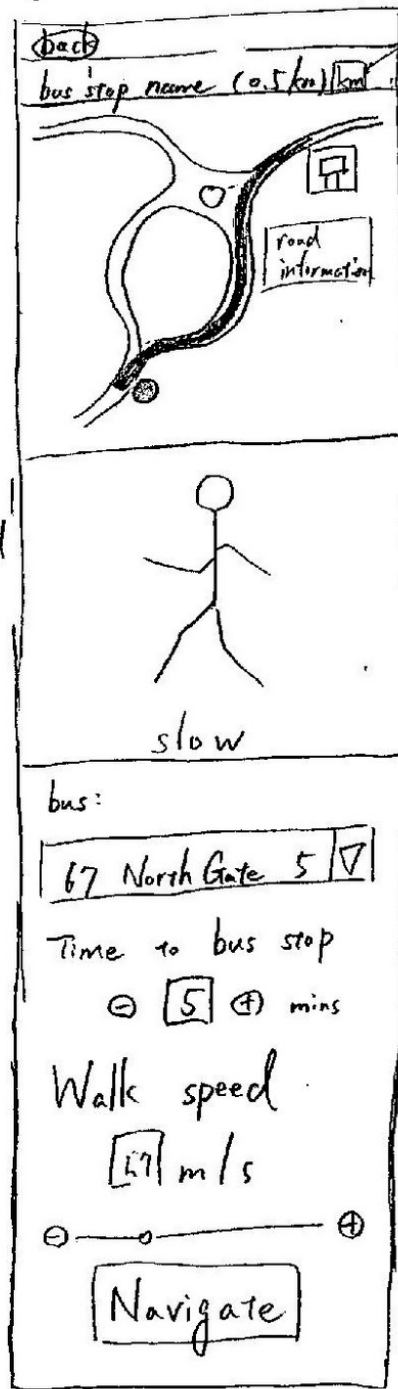


Figure 1 - Boxes at the bottom of each screen are iPhone buttons

Navigation Setting Screen

animation will reflect walk speed setting below.



user can choose km or miles.

- bus stop name / distance

- users can drag current path to another path they want.

(by default, it is the shortest distance path)

- animation showing how fast user has to move.

- the word below the human is showing if this speed is fast / normal / slow. this description depends on the weather

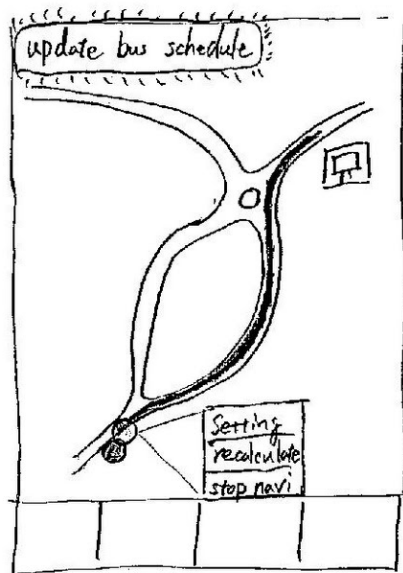
- user can choose the bus they are looking for. (default: top of the bus schedule list).

- set time to bus stop. (default: bus arriving time).

- set walking speed (default: calculated from distance and time setting above)

- click on [Navigate] to start navigation

Figure 2



- User can click on the pager to see pop up window.
 - choose setting to go back to navigation setting screen
 - click recalculate to recalculate moving speed of pager circle
 - stop navi to stop navigation and go back to OnebusAway main window
- if OneBusAway updates the bus schedule, a button shows up and user can click on that button to reset the setting again.

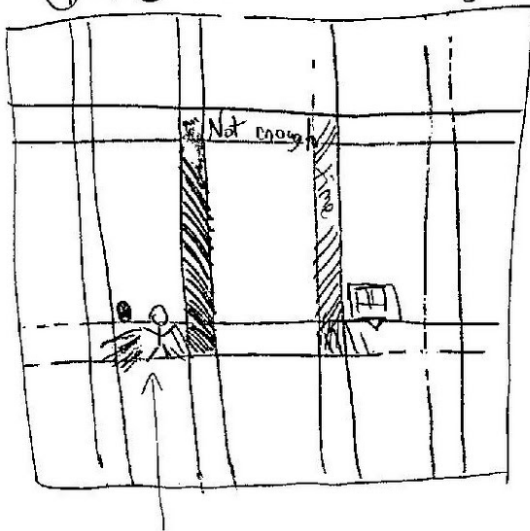
Figure 3

③ → ⑤ Once the use starts moving and goes back to ③ if they are stopped at a light or just not moving

⑤

Pace	Route	destination	minutes
Run faster	73	2nd point	4
Good Pace	30	University	5
Relax	71	Lake City	15
You can walk	72	WedgeWood	25

④ → ⑥ The user can drag the route or add waypoints to make a new route.



The user is behind schedule since they are behind the stick-figure paces.

Figure 4

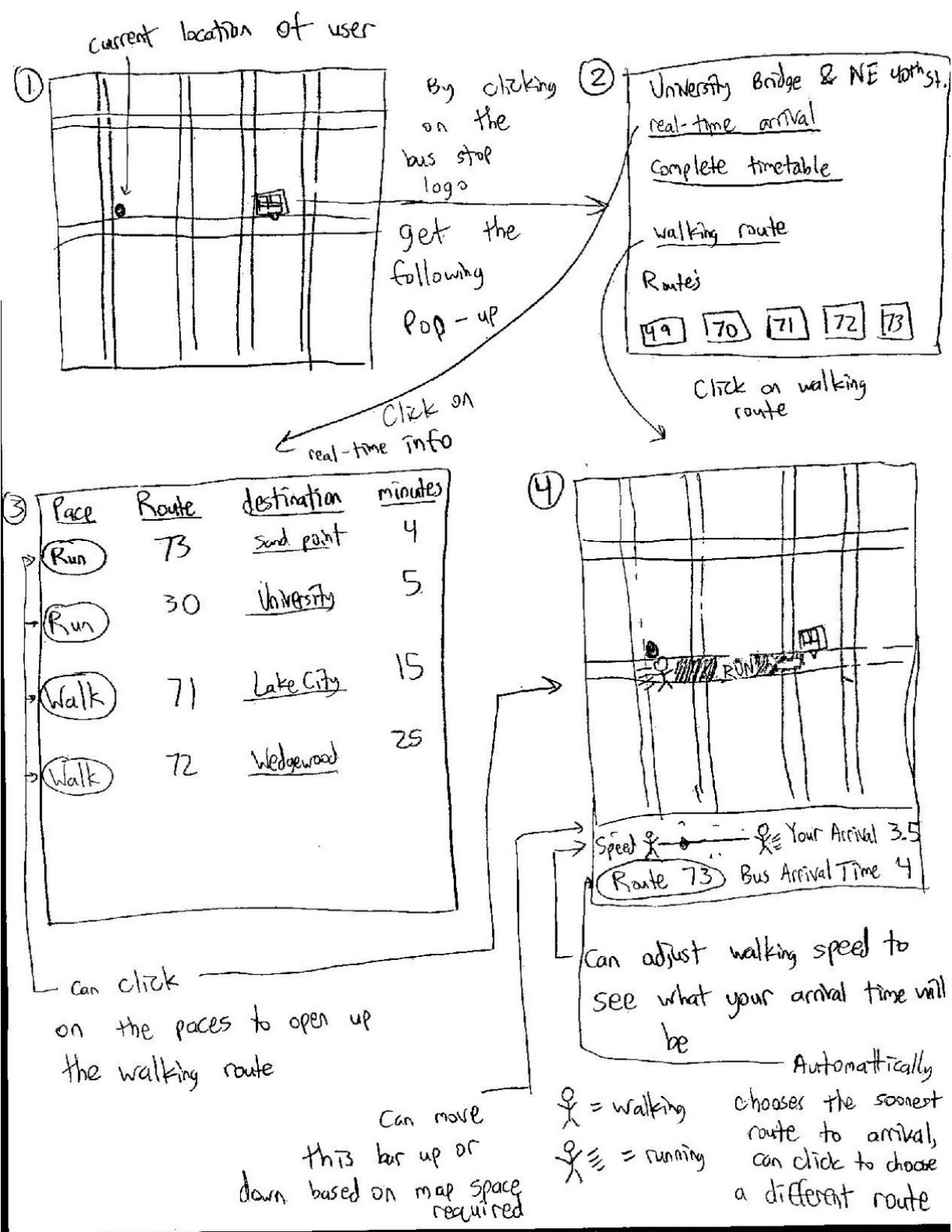
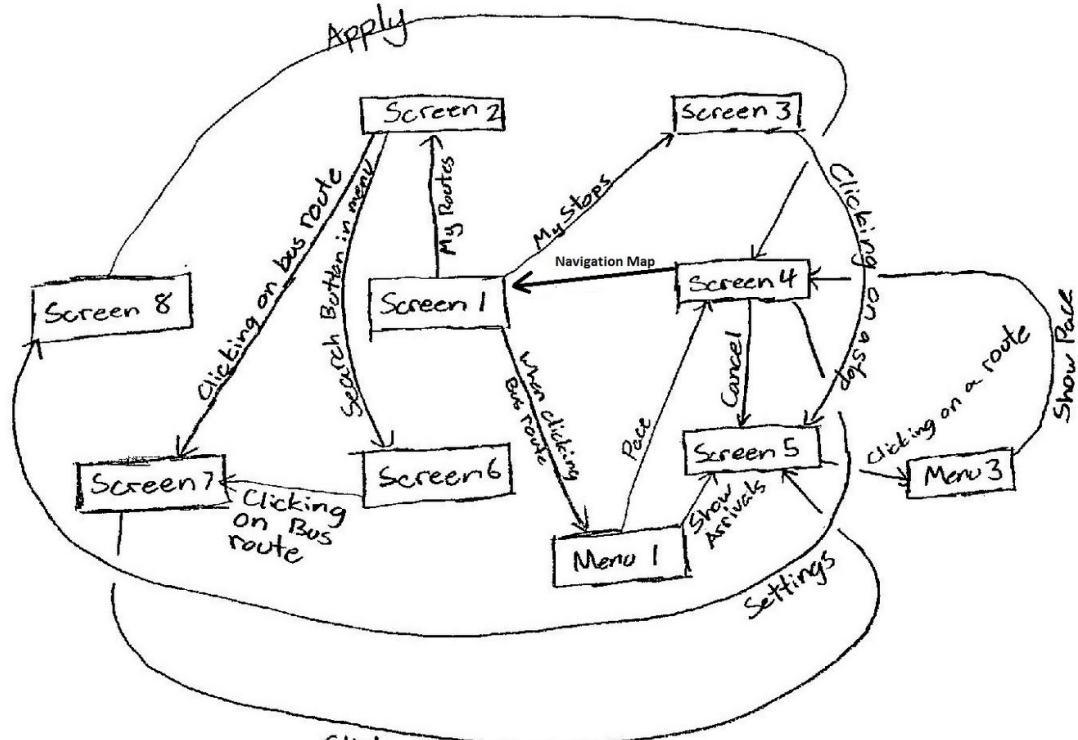


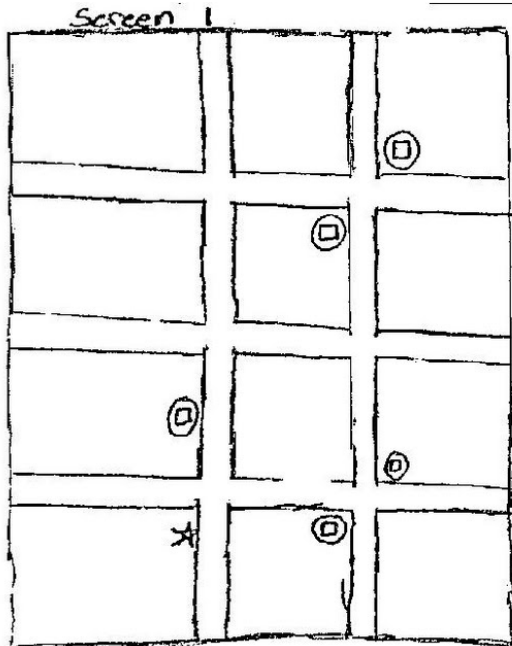
Figure 5

Design #3 - Textual Navigation with Visual Map Option

Clicking back on the device will travel to your previous Screen.



Clicking on a bus Stop
Figure 6



Clicking a bus Stop brings up Menu 1
Menu 1)

15th Ave Ne & Ne 41st St
 Distance: 0.8 miles
 Estimated walk Time: 7 mins

Show arrivals | Show Routes | Pace | Screen 4

Screen 5 Pop up showing Screen 4
 all bus #s
 that go to
 that stop

Menu 2)

Add Check Point | Cancel

Menu Button

My Location	My Routes	My Stops	Pace	Stop Nav
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Centers on your location
 Screen 2
 Screen 3
 Screen 4
 (Grayed out if not in pace route)

Screen 2

132 Des Moines	★
122 Des Moines express	★
71 View Ridge	★

Menu Button

Search

Screen 6

Screen 6

Enter Route #

74 Sand Point ★

Clear Results


Clicking a route on Screen 2 or 6 goes to screen 7

Figure 7

Screen 4

Pace to 15th ave & 41st st
for route 855

Pace Needed: 3MPH
Current Pace: 2.5MPH
Distance Remaining: 0.8 mile



Walk Faster

Navigation Map

Menu Button

Cancel | Settings | Wait for next bus

Settings button goes to screen 8

Screens ^{Screen 5} Screen with nav overlay. The overlay shows recommended path in color

Green = going faster than needed
Yellow = about the correct speed to arrive on time
Red = going to slow

Clicking on the map will bring up Menu 2 (seen next to Screen 1)
Screen 8

Arrive before bus by
⊖ 2 ⊕ minutes

Avoid heavy intersections
 On Off

Maximum Pace

Menu Button
Apply

Figure 8

Screen 5

15th Ave Ne & Ne 41st st		
Distance: 0.8 miles		
Estimated Walk Time: 7min		
855	Lynnwood 3:35pm	13
880	Mukilteo 3:42pm	20
860	Mccollum Park 3:44pm	22
Menu Button		
Filter Route	Show on Map	Refresh

Clicking a route brings up menu 3
Menu 3

⊙ Bus Options
Show route info
Show only this route
Show route schedule
Show Pace

Default function from One Bus Away

Goes to screen 4 using this stop + route

Figure 9

Screen 7

132 Des Moines Metro Transit
⑦ Des Moines
④ Downtown Seattle
Highline Cab S 240th St Distance 15 miles
Lists all bus stops and their distance from you.

Clicking a stop goes to screen 5

Menu Button

Nearest Stop Des Moines	Nearest Stop Downtown
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Goes to screen 4

Screen 3

3rd Ave & Pike St Southeast Bound Distance: 2 mi
8th Ave & S 194th St North Bound Distance: 30 mi
University Way & 41st St South Bound Distance: 5 mi

Clicking a stop goes to screen 5

Menu Button

Remove all Starred Stops

Figure 10

Selected Interface Design

After taking into consideration the participants' opinions from our contextual inquiry, comments from previous assignments, and our own goal of wanting a design that's easy-to-use and simplistic, the group selected the Textual Navigation with Visual Map Option (design three).

Reasoning for Choice

Our chosen design was selected primarily because its impact on the current OneBusAway application is minimal and unobtrusive. This design for OnePaceAway changes very little of OneBusAway and attempts to meld seamlessly into the interface that is already there. This will minimize the learning curve of using OnePaceAway for OneBusAway users as they will already be familiar with the OneBusAway interface. In contrast, designs one and two introduce their own menu groups and flows separate from OneBusAway's and increase complexity.

The chosen design also provides more information. It gives the user their speed in a more usable way by providing the user's current speed and the speed needed to catch the bus side-by-side, thereby allowing comparison at-a-glance to see if they need to move faster in addition to the visual aide. Users are also able to adjust their desired arrival time to a bus stop regardless of the arrival time of the bus, which lets users manually account for known inaccuracies in OneBusAway information.

Functionality Summary

With our chosen design, users will have access to the following functionality for OnePaceAway:

- View the fastest travel path to a selected bus stop. This path will be adjustable by the user through use of waypoints.
- Find the walking speed required to reach a selected bus stop on time to catch a selected bus. These are in real time and will automatically update from updated bus arrival times in OneBusAway. If the speed required is beyond a certain threshold, it will be deemed impossible for the user to catch the bus and the user will have the option of targeting the next bus on that route.
 - Required arrival time at a bus stop will be adjustable. (ex. target arrival at stop several minutes earlier or later than estimated arrival time of bus given by OneBusAway).
- Speed estimates will be affected by weather effects in the area - a feature that is toggle-able.

Interface Description

When the user opens up OneBusAway, they are greeted with a map (Figure 7 Screen 1). If the user clicks on a stop then the OnePaceAway menu (Figure 7 Menu 1) pops up. If they don't want to choose a bus from the map they have several options. They can go to a favorites section containing all their favorite route numbers (Figure 7 Screen 2) by pressing "My Routes" in the menu, or they can look through their favorite stops (Figure 10 Screen 3) by pressing "My Stops" in the menu. Both of these allow the user to select where and which bus they want to take and allow them to use the OnePaceAway add-on to get navigation help.

The OnePaceAway menu gives users a quick overview of all the pertinent information. If they click on the “Show Arrivals” button, then they will be taken to a list of routes (Figure 9 Screen 5) which shows the buses arriving next at that stop. From here you can either look at general information about each bus or you can select an arriving bus to bring up a menu (Figure 9 Menu 3) and click “Show Pace” for this bus.

Pacing a bus brings you to the pacing screen (Figure 8 Screen 4) which gives you general information about how fast you need to walk and how far you need to walk to catch the selected bus. There is also a visual image of someone walking to give you an idea of how fast you will need to walk and a message telling you to either walk faster or that you can walk slower. Selecting “Settings” will bring up a menu (Figure 8 Screen 8) that allows the user to change a maximum pace, set whether or not to avoid large intersections, and set how many minutes earlier or later that they would like to arrive. If a fact/text based screen is not what is needed or if navigational directions are needed (when the user is not familiar with the path they will need to walk), the user can click the “Navigation Map” in the menu from the pacing screen. From this screen users will be able to view a map and a highlighted path to their stop as well as a textual prompt for whether they are walking too fast, fast enough, or too slow depending on colors.

From the navigation map, the user can also click a point on the map and add a checkpoint. Adding a checkpoint forces the route to include this point and updates walking speeds and distances accordingly.

Easy Scenario - View navigation information to bus stop

Jessica is an 18 year old freshman attending the University of Washington. She is trying to get home by bus after her first day of class and is unfamiliar with the campus. Furthermore, sudden inclement weather has settled and the roads are completely covered in snow. She knows that the particular route that she will take to go home has a bus passing by the stop every 10 minutes, so time is not an issue. Although OneBusAway tells her where her stop is, she does not know how to get there. She also wants to minimize her wait time at the bus stop to minimize exposure to the cold weather.

To solve her dilemma, she opens OneBusAway then finds her stop on the map. Clicking on the stop brings up a menu displaying the distance to the stop and the estimate walk time (assuming normal walking pace). She then clicks “Pace” then “Navigation Map” on this new screen. Here, a map is accessed with the path to her stop highlighted. Confirming the route and the estimated walking time, she waits until the last possible minute to leave then safely arrives at the bus stop and only has to wait in the snow for about 30 seconds before her bus arrives.

Moderate Task - Adjust pace as necessary to catch a bus

George is a 36 year old gentleman wishing to get home after a long day at work at a Red Square concession stand. He needs to take the bus to King Street Station so that he can take

the Sounder train home. Although his bus arrives at the stop in 10 minutes, George doesn't want to close early and risk losing sales. He stays 5 more minutes to serve the last-minute customers, then quickly closes shop. Knowing that he has 5 minutes left to get to his stop, George wonders if he can make it in time to catch his bus and, if so, how fast he must travel in order to do so.

George opens the OneBusAway application on his Android phone and finds his stop on the map. He clicks on the stop then presses "Pace" from the resulting menu to access the pace screen. Here, he sees that the pace needed to travel from his current location to his bus stop is 3 mph. He begins moving towards his bus stop, checking the pace screen at regular intervals. On the first check, the screen notifies him that he is travelling at 2 mph. George quickens his pace, checking the pace screen regularly to ensure that he stays above 3 mph, and is able to just barely catch his bus home.

Hard Task - Dynamically adjust path estimate to bus stop

Jack is a 52 year old UW professor. Today, he has plans to meet with a friend in a neighboring city, which he will travel to by bus. Jack does not ride the bus often, and his knowledge of nearby bus stops is extremely limited. Before leaving his office, Jack uses opens OneBusAway, presses "My Routes" in the menu, then presses "Search". On this search screen, he finds the stop that he needs to go to and clicks on it. The application then displays a list of routes at that stop. Jack finds the route that he needs to take from this list, clicks it, and presses "Pace" to access the pace screen. From here, he presses "Show Pace" and finds the travel path to his stop.

Unfortunately, while walking to his stop Jack has neglected to periodically check the map while travelling (to ensure that he was on the right track) and now finds himself lost. He needs to reorient himself and locate where his bus stop actually is. He opens the application, goes through the steps listed above, then looks at the path to the stop again (which updates automatically from Jack's new location). According to the pace screen, Jack is too far from the bus stop, and it is now impossible for him to catch his bus. He then presses the "Wait for Next Bus" button, which recalculates the pace according to the arrival time of the next bus on his route. Because the next bus does not arrive for another 30 minutes, Jack has plenty of time to get there and safely does so, checking the map regularly this time to make sure that he does not get lost again.