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.

Representative Tasks

Easy Task - View navigation information to bus stop

Jessica is a senior traveling from Suzzallo Library to her bus stop. She is catching a bus at 15th AVE and NE Campus. She is traveling to her home in Wedgewood so she needs to catch route 65. She doesn't know the exact route to the stop so she needs to look at the navigation map.

Moderate Task - Monitor pace needed to catch a bus while accounting to weather

Matt is getting out of classes for the day and realized that it was snowing out. He needs to catch a bus at 41st St and 15th AVE SE. He is traveling to Woodenville so he needs to catch the 372 express bus. He sees that it is getting there soon, but needs to change his settings to account for the bad weather. He changes his settings and sees that there is still enough time for him to catch his bus.

Hard Task - Dynamically adjust path estimate to bus stop

Harry is new to the area; he just got a job at a local start-up. He needs to get to 15th Ave SE & Pacific St Southbound. He is heading to Northgate mall to meet up so he needs to catch route 75. He doesn't like to run so he needs to change his maximum pace settings to 7 mph. He looks at the navigation map but still heads in the wrong direction. He gets lost and refreshes his map. OnePaceAway lets him know that he is going to be unable to reach bus stop in time. He agrees and decides to catch the next bus. He sees that there is plenty of time to catch this bus and is

able to find his way there.

Interface Revision Sketches
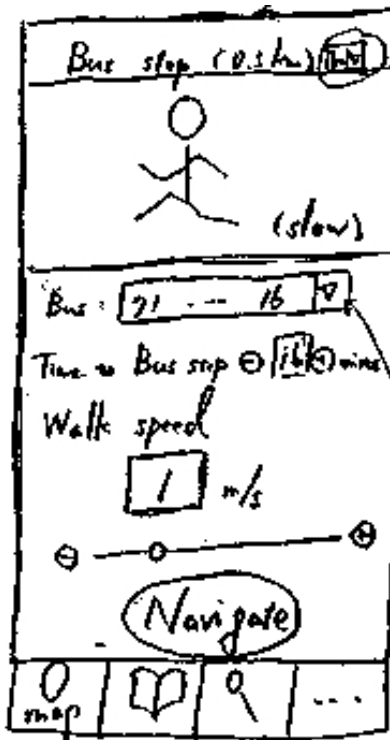
<u>Early Sketches</u>

Figure 1 - Early Design Sketch for Pacing Screen

With our early designs, we put into place many requirements that we learned from contextual user inquiries. We sketched a design that integrates closely with the existing OneBusAway interface and tried to minimize the number of new screens added to support OnePaceAway functionality. One of these new screens - the pacing screen (Figure 1) - contained all of our functionality concerning pacing in one screen.
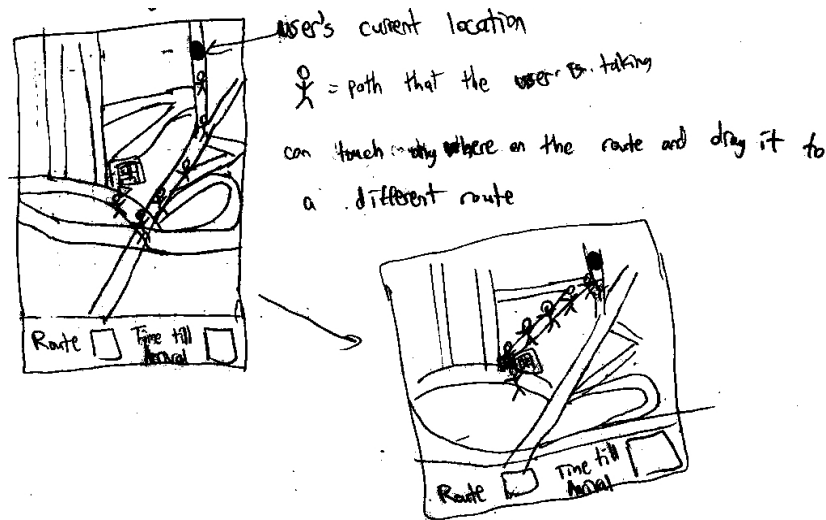
Figure 2 - Early Design Sketch for Navigation Map

Pressing the "Navigation" button would bring the user to the navigation map screen (Figure 2). Here, the user will be able to view a route (represented by a line of stick figures) from their current position to the selected bus stop.
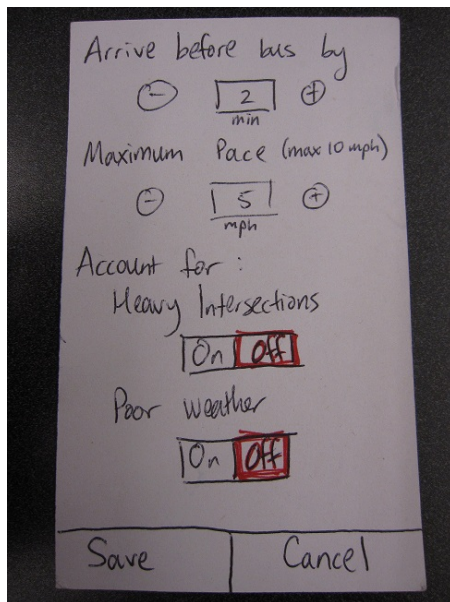
Applying User Test Results

Figure 3 - Pacing Options
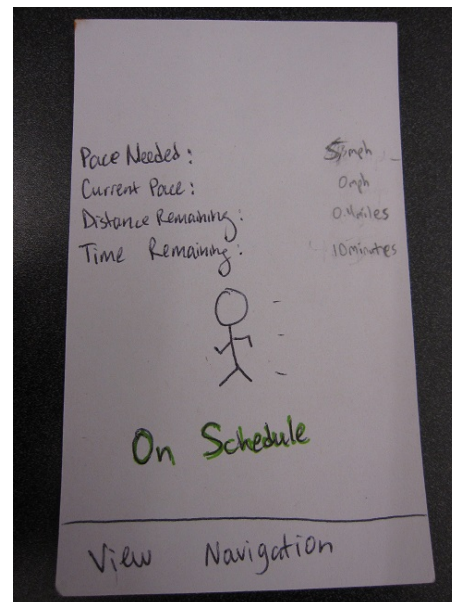

Figure 4 - Pacing Screen

Initial rounds of user testing revealed two things. First, the pacing screen was rather cluttered and busy. Users felt overwhelmed by the many options on the screen. In response, we changed the design to spread the features on the pace screen across many screens to keep the scope of each screen manageable (Figure 3 and 4). We also improved the flow of some of the features. For instance, instead of using a drop-down list to select bus stop/bus route to calculate the pace

to, the user will need to select a bus stop from the map screen, then select the "Pace" option from the resulting popup (Figure 5A). This automatically select the bus that arrives soonest at that bus stop to calculate the pace for.
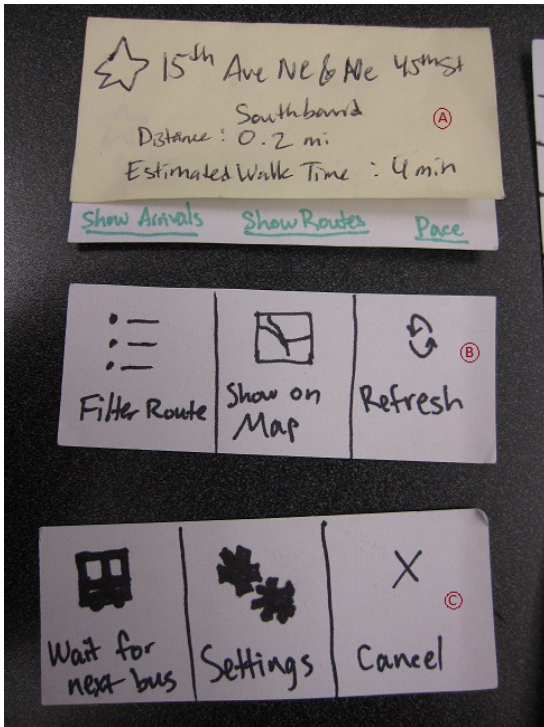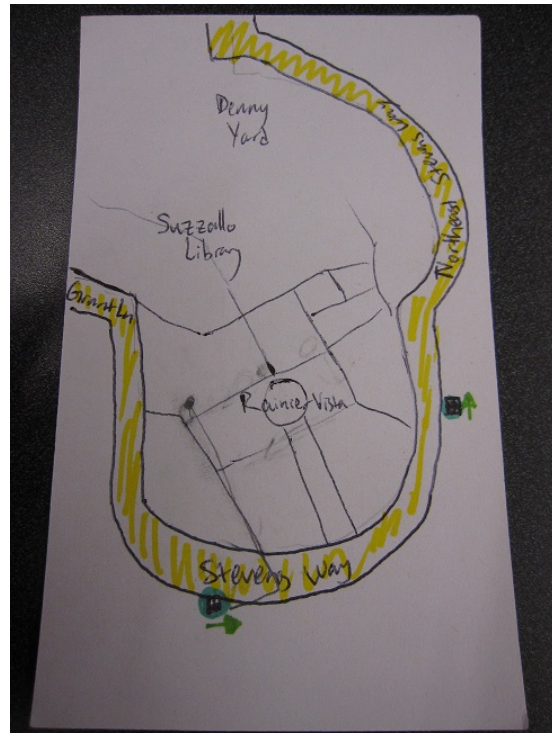

Figure 5 - Assorted Menus

Figure 6 - Navigation Map with straight line

Second, we found that the line of stickmen on the navigation map made the map look very busy and unnecessarily obscured parts of the map. In response, we changed this to a simple straight line to minimize real estate used as well as make the path more visible (Figure 6).
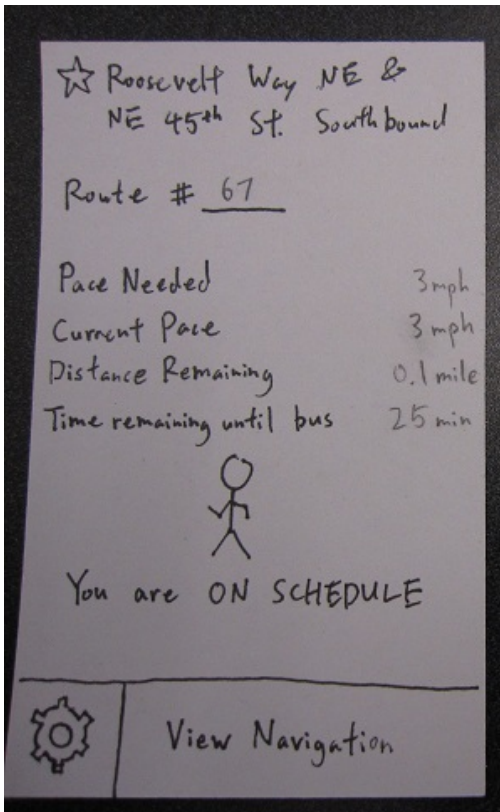
Final Iteration
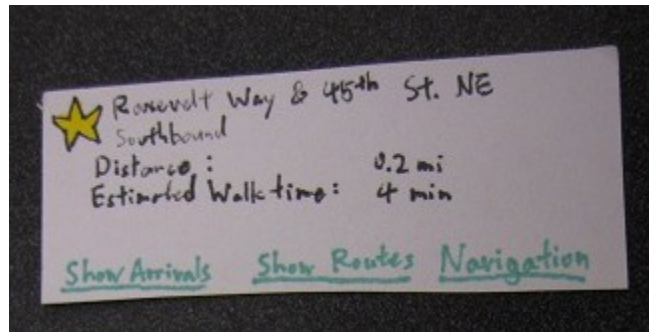
Figure 7 - Pacing Screen w/ Settings

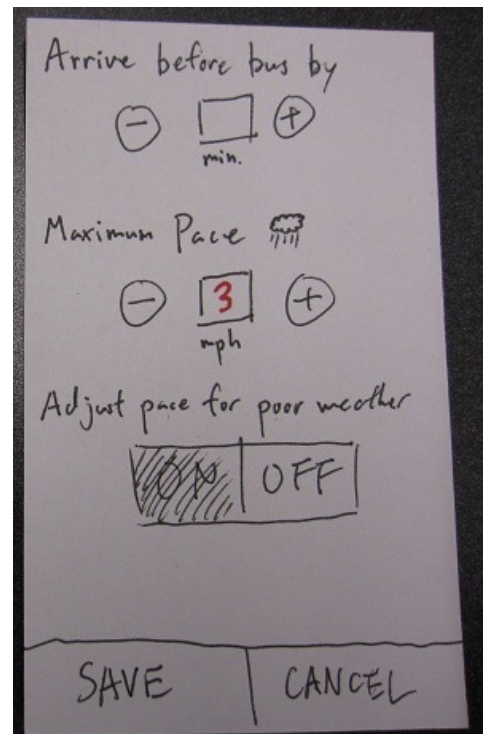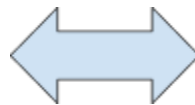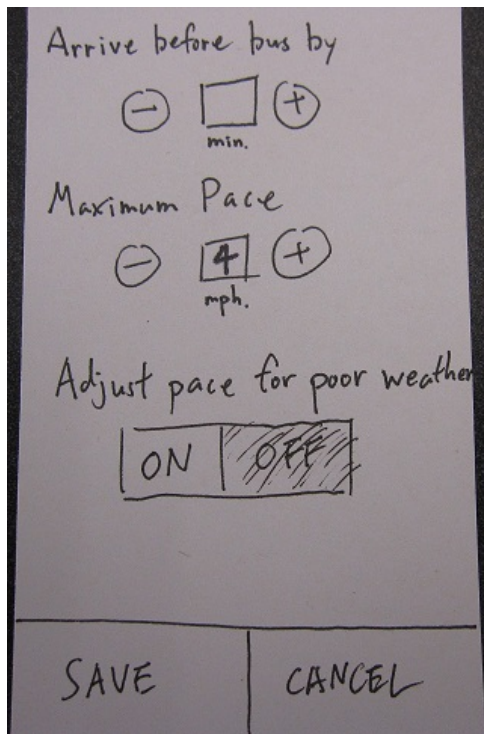Figure 8 - Bus Stop Pop-up on Map Screen

Figure 9 - Pace Settings Screen

Further user testing with our low-fidelity prototype revealed more flaws that we had to address in the interactive prototype.

First, users were having trouble finding the pace settings screen because it was only accessed by opening a menu (originally via the android menu button - this was a problem because not all smartphones have such a button) from the pacing screen. In some cases users were not aware of the existence of the settings. To solve both issues, we added a setting button that brought the user directly to the settings screen on the pace screen (Figure 7).

Second, wording on the bus stop info pop-up accessed on map screens were ambiguous and confusing to users. We improve the wording to be more self-descriptive as well as improved the flow users need to go through to reach the pace screen (Figure 8). Specifically, users will now have to select a bus from a list before proceeding to the pace screen.

Third, we changed two things in the pace settings screen. We cut a feature to account for heavy traffic because it was poorly defined and we found that it was not very useful for users through user testing. Second, we added indicators for what and how values were changed when the "adjust pace for weather" feature was turned on (Figure 9).

Prototype Overview

Overview of Implementation

We implemented our interactive prototype in terms of our three representative tasks. It contains the flow and screens necessary to complete all three tasks.

As in OneBusAway, when the application is first opened, the user is presented with a map screen (A1, A6, A13). Here, they can use OneBusAway's existing search features or manually locate a bus stop that they need to get to. Upon clicking a stop, the user is presented with a pop-up providing various information to that stop, including the distance and walking time from the user's current position (A2, A7, A14).

On the same pop-up, there are a number of different options that the user can access. "Show Routes" and "Show Arrivals" are both existing original OneBusAway functionality. "Pace" leads to the first step that will allow users to access main OnePaceAway features. "Show Navigation" will simply overlay a path from the user's current position to the selected bus stop (as shown in A5, A20, A21).

Upon selecting the "Pace" option, the user will be presented with a list of bus routes that service the selected bus stop (A3, A8, A15) along with the real-time arrival information of each bus. Here, the user will be able to select a specific bus for pace calculations. Doing so will bring the user to the main screen of OnePaceAway: the pace screen.

In the pace screen (A4, A9, A16), the user is able to view pacing information that pertains to how fast they must travel in order to catch their selected bus at the selected bus stop. For flexibility, the user has 3 different way to consume this information:

- First, they can view the figure of the stick figure in the center of the screen. The pose of the figure represents whether or not the user needs to increase their travel pace in order to catch their bus.
- Second, there is a text below the stick figure that explicitly tells the user whether they are ON SCHEDULE, BEHIND SCHEDULE, or AHEAD OF SCHEDULE for catching the bus.
- Third, the user can view how fast they are currently moving and how fast they should be moving to catch the bus. The user can easily know if they need to quicken their pace by comparing this information.

From the pace screen, the user can click on the gear icon in the bottom left corner to access the pacing settings screen (A10, A17). Here, users can specify how early they wish to arrive to their selected bus stop. This is our solution to allow users to account for inaccuracies in OneBusAway schedules and will adjust the pace accordingly. Users can also specify a maximum pace that they are willing to travel up to as well as whether or not to adjust this maximum pace for weather. Adjusting for poor weather will simply decrease the maximum pace by a factor of 2, and toggling it on will turn the maximum pace red and add a stormy cloud icon (A11) to signify that it is being adjusted.

If the pace needed to catch a bus ever exceeds the user's set maximum pace, the user will be prompted with the option to select the next bus that arrives at their selected stop to pace to (A22). Selecting "Yes" to this prompt will bring the user back to the pace screen with updated information for the next bus. (A23)

Finally, pressing "View Navigation" from the pace screen will bring the user to a map overlayed with a path to the bus stop from the user's current position (A5, A20, A21). This is the same as the "Show Navigation" option from the bus stop info pop-up described above, except the latter is designed as a shortcut for users who do not want to go through the pace screen flow to reach the navigation map screen.

Scenarios:
For each scenario click on the given task button at the bottom.
Task 1: Starting from A1, the users clicks on the stop icon for the stop at 15th Ave NE & NE Campus Parkway. A menu will appear at the top (A2), click on Pace. The real-time arrival table will appear up (A3). The user then clicks on the second arriving bus for route 65; it arrives in 22 minutes. The pacing screen (A4) gives the user the important information needed to get to the stop on-time. The user is satisfied, so they click on the view navigation page to be taken to the final screen (A5) and to see the route.

Task 2: Once the task 2 button is pressed, the user is taken to A6, where they can click on the

stop near the top middle of the page, 41th St & 15th Ave NE. This brings up the menu at the top of the screen with the stop information (A7). The user can click on the pace button at the top right to be taken to (A8), the real-time arrivals screen. From here, the user clicks on the desired route, route 372E. This takes them to the pacing screen (A9), from here the user can go to the settings screen by clicking on the gear in the bottom left. The user, now on screen (A10), realizes that there is bad weather so they click on for adjust for poor weather. They are now on A11. Once the user is satisfied they can click on apply to be taken to the last screen of the task, A12, the pacing screen.

Task 3: Click on the task 3 button to be taken to A13. Click on the stop near the bottom right, 15th Ave NE & Pacific St Southbound. This takes the user to A14 where the pop-up menu at the top appears. The users can click on the pace button at the top right to continue to A15. This is the real-time arrival page, here the user clicks on route 75. The user is now on the pacing screen, A16. The user wants to allow more time to get to the stop so they click the settings button to arrive at screen A17. The user clicks the plus sign underneath the Maximum Pace button 6 times to adjust the number to 7. This takes them to screen A18. The user clicks apply to be taken back to the pacing screen, A19. The user can click on the view navigation button to see the route on the map, A20. Once the user clicks, the map updates the user's current location and takes them to screen A21. There isn't enough time so after the user clicks again, an error will appear (A22) up letting the user know that they will need to go over their maximum pace to reach the stop. Once the user clicks yes, they are taken to the pacing screen, the final screen, A23.

Description of Tools Used

We used javascript and HTML to create our interactive prototype, in order to be able to present the demo on a webpage. This decision proved useful because it made it easy to integrate into the website. However, these tools did not help in that all members of our group were relatively inexperienced with javascript. Because of this, there were definitely inefficiencies in the system design that lead to a longer development time than normal. This inexperience also led to us being constrained in what we were able to do in the interactive prototype and as a result the prototype is not as "interactive" as we would have liked (it does not behave as a real application would - no back button functionality, for example).

Miscellaneous

In terms of what we didn't implement, we did not include existing OneBusAway features not pertaining to our tasks. We did not believe it was a good use of our time adding in these existing features as it did not demonstrate OnePaceAway functionality.

Something that we also left out of the interactive prototype was functionality for the "Show Navigation" option in the bus stop info popup on the map screens. This is because it is identical in functionality to pressing the "View Navigation" button on the pace screen. In fact, Task 1 can be finished by having the user select this option instead of "Pace", but we did not choose to allow this in order to give the user a quick tour of and allow them to familiarize themselves with OnePaceAway screens for the subsequent tasks.
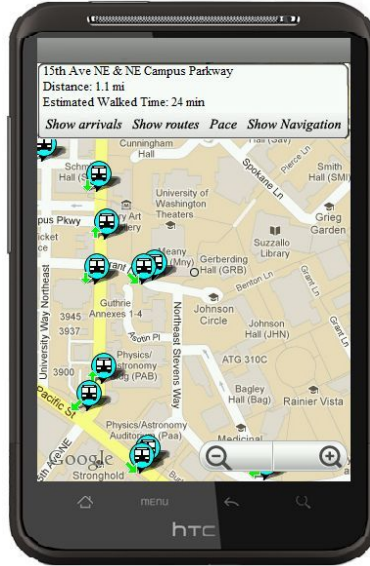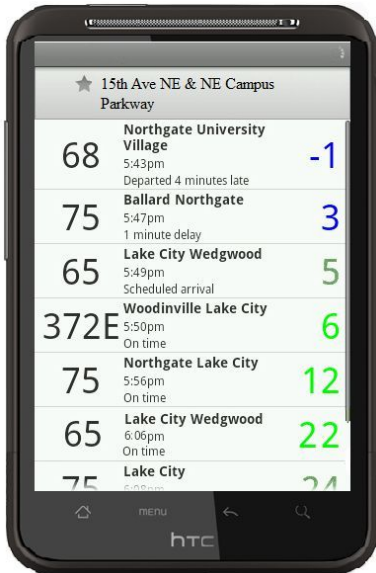
Appendix A: Prototype Screenshots
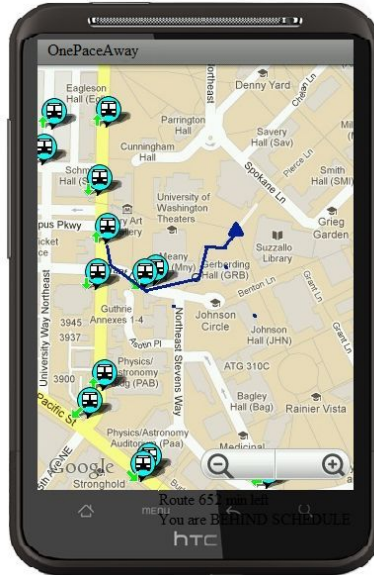**Task 1**

A1: Starting map

A2: stop pop-up menu

A3: real-time arrival menu

A4: pacing screen
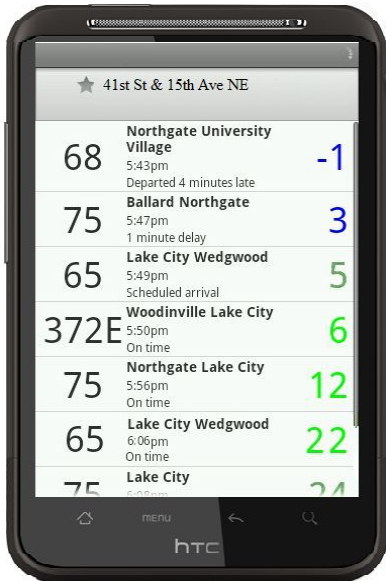
A5: Navigation screen

Task 2

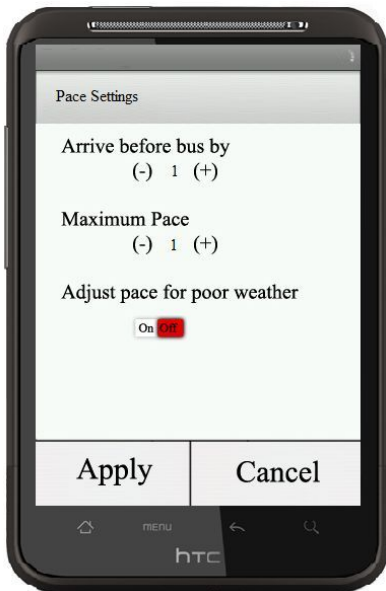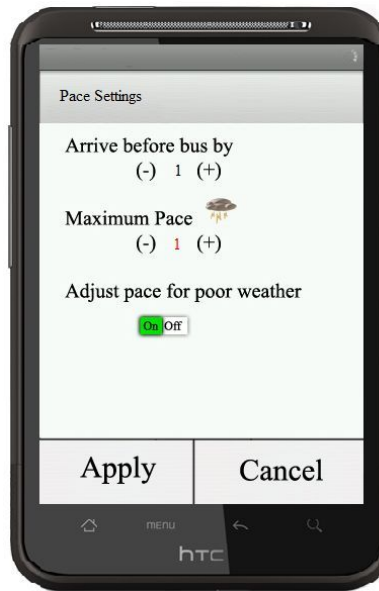

A1/A6: main screen
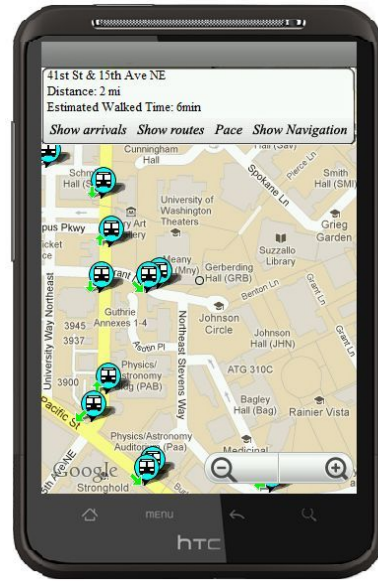
A7: second task pop-up

A8: real-time arrival info

A9: pacing screen

A10: Settings screen

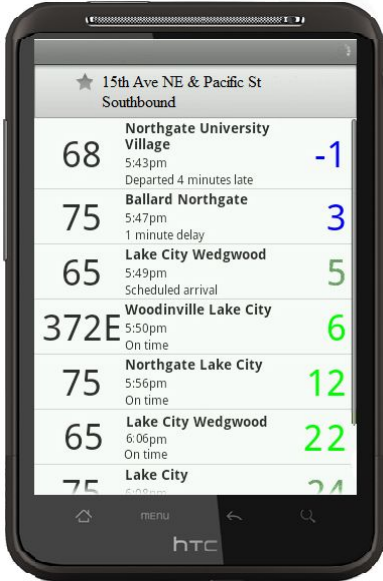**A11: Settings screen adjusted**

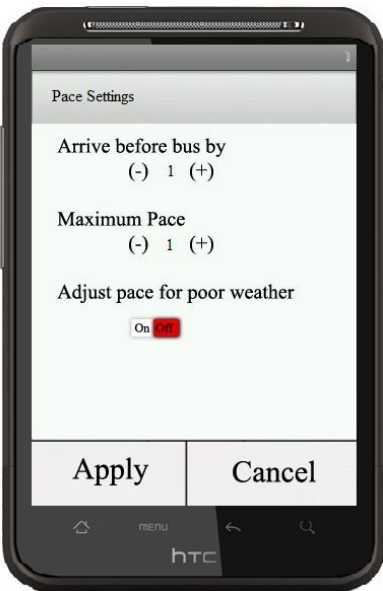**A9 / A12: pacing screen again**
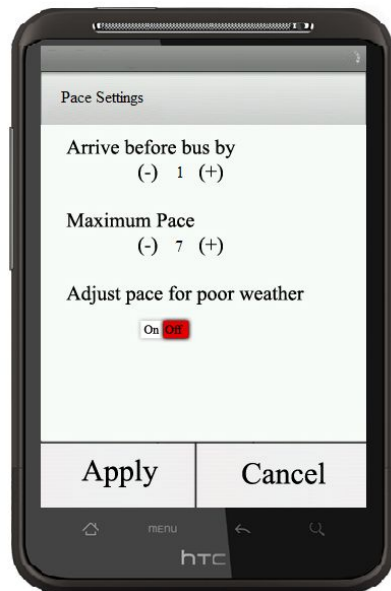
Task 3

A13: main screen

A14: task 3 menu pop-up

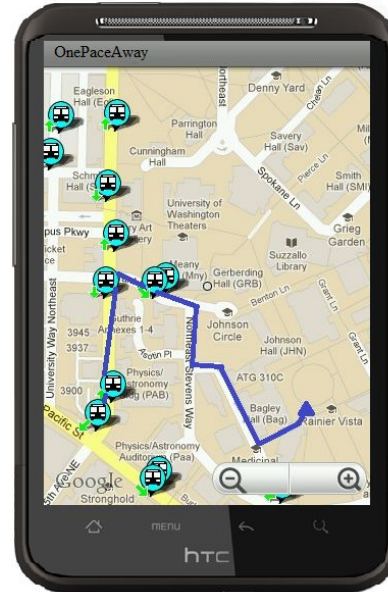**A15: real-time arrival info**
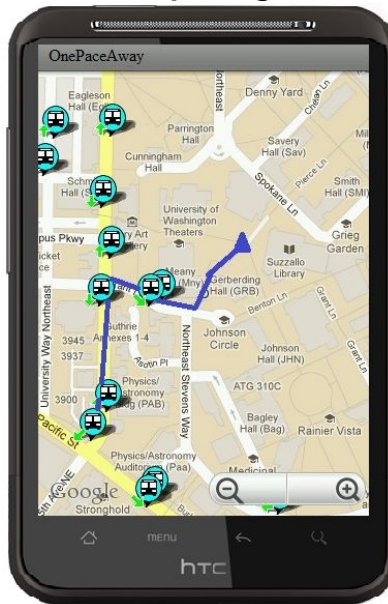

A16: pacing screen

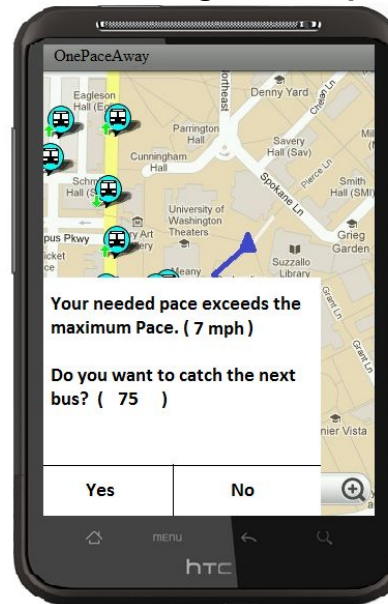**A17: Settings page**

A18: max pace adjusted
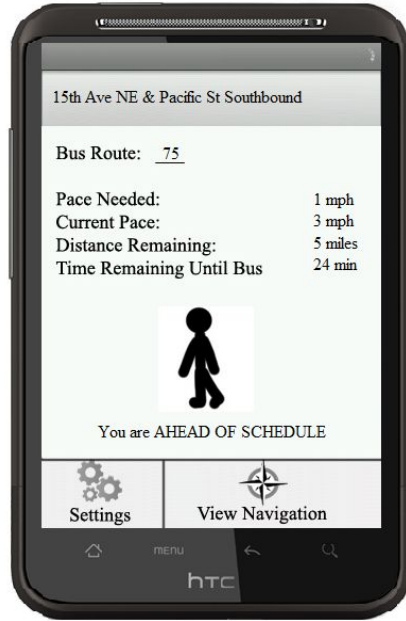
A16/ A19: pacing screen

A20: navigation map

A21: navigation map updated screen

A22: take next bus error

A23: updated pacing screen