Jeff J.Lin	Facilitator/Greeter
Joel Kollin	Observer
Ryan Phillips	Computer
Artem A. Zhurid	Observer/Greeter
Beltran Ibarra Davila-Armero	Observer/Greeter

URL: http://www.cs.washington.edu/education/courses/cse490jl/CurrentQtr/projects_files/groupe/3-lowfi/

Introduction

Our goal was to evaluate a bus navigation system to be implemented on cell phone which can be used to track buses and find stops as well as plan trips, both in advance and in transit. We were mainly interested in how different people would actually use our system and how intuitive (or not) they found the interface to be. We also wanted to identify anything that didn't seem to work as expected, and to solicit opinions on what might be improved or added.

Mission Statement

We will create a bus navigation tool that can be used by a broad range of people to easily find and ride buses. Specifically, it will assist anyone with a cell phone in efficiently planning trips, tracking buses, and generally navigating the routes of a complex urban mass-transit system, regardless of their location or knowledge.

Prototype Description

Our low-fidelity prototype is a paper version of a cell phone, consisting of control pad and screen. Participants interact with the imitation device using the control pad, where actions cause the screen to change when appropriate.

Below is a list and description of all control buttons on the control pad that participants can use to interact with the cell phone:

- 'OK' button – performs an action on the selected item, or transitions to the next screen (when appropriate).
- 'MENU' button – returns to application's main menu.
- 'BACK' button – navigates to the previous screen.
- 'UP', 'DOWN', 'LEFT', 'RIGHT' buttons – move the cursor/focus between items on the screen.
- Numbers 0 through 9, with corresponding letters on each button, * and # – used to enter information manually or shortcut through menus.

The device is simulated by presenting the participant with a paper control pad and screen. A colored transparency is used to highlight selected menus and items. The participant navigates through this environment by pressing the buttons drawn on the control pad. The person designated as computer reacts by moving the cursor, changing the screen by laying down a new card, or by placing transparent text on top of the screen.

On an actual cell phone, any text entry would be done on the number pad, using the phone's text input system (such as T9). Because this was impractical for a paper device, we allow the participant to simply tell the computer in words what they would like to type.

In each scenario, the participant is first presented with a main menu screen. There is a "Quick info" menu item that provides some information about a route that the device expects will be useful. Following that are the "Current Trip", "Plan Trip", "Bus/Stop Info", and "Mark this Location" menu items. "Current Trip" provides some brief information about a previously planned trip. "Mark this

Location" lets one give a name to their current location. "Plan Trip" and "Bus/Stop Info" are much more involved:

"Plan Trip" asks for a starting location, a destination, and a time through a series of screens. Locations can be the current location, a bookmarked location, or an address/intersection. The time can be either for departure or arrival. A summary of possible trips is then presented. Criteria like "fastest", "least walking", or "least transfers" can be changed by scrolling a text box left and right. Once a trip is chosen, a more detailed description of the trip is given with the option to store it for later. In addition, users can specify on what days of week to repeat this trip by checking checkboxes corresponding to each day of a week.

"Bus/Stop Info" asks for a route number, or a bus stop specified by current location, bookmarked location, or address/intersection. If a stop is chosen, a list of buses at that stop is given, with times of next departure. Once a bus route is selected, information about the route is presented along with time tables for a particular stop. The stops for that route can be traversed by scrolling a text box left and right. Buttons are provided for reversing the route and for viewing other bus routes at a stop.

Below are two figures to illustrate our prototype. The first (Fig 2.1) demo's the prototype system with participants interact. The later (Fig 2.2) shows the high level view of all screens and components that make up the prototype.
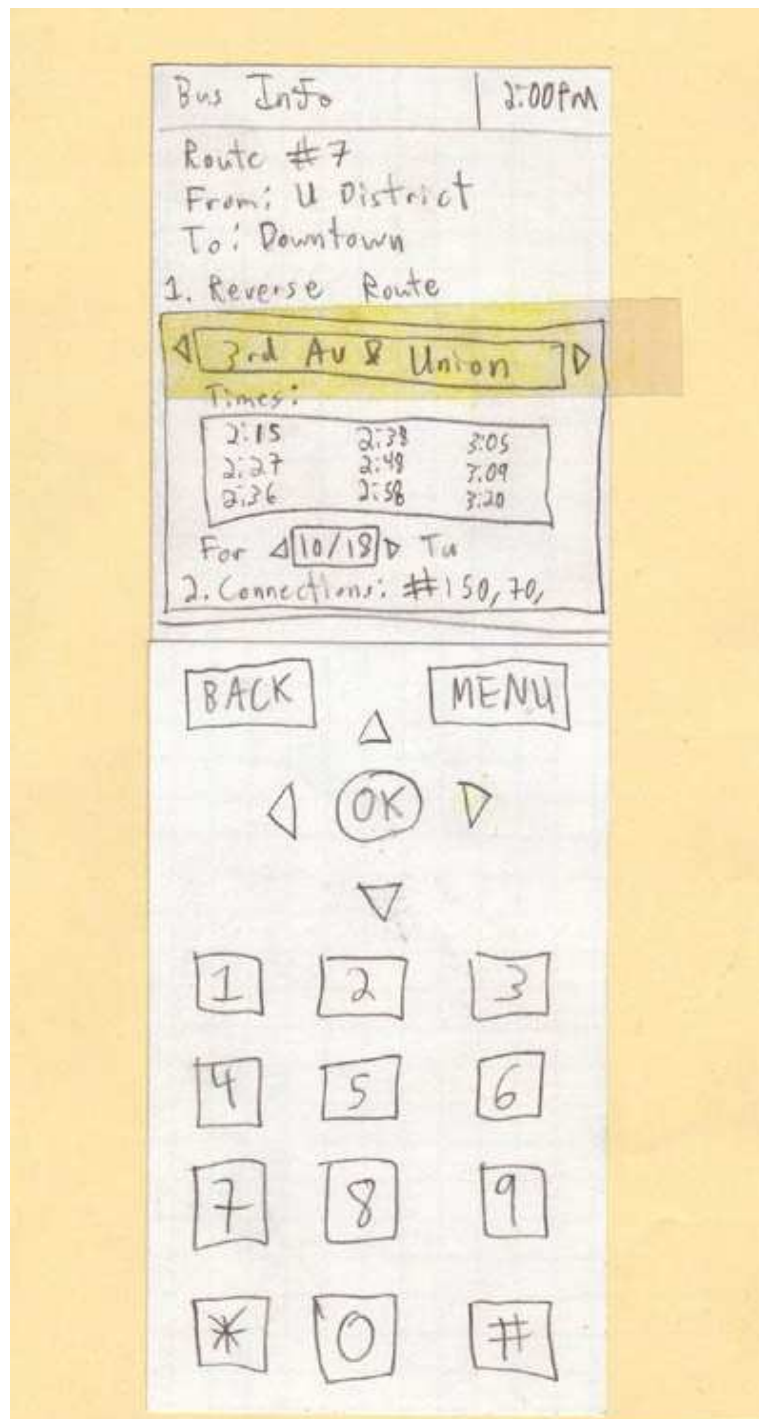
Fig 2.1: Low-fidelity prototype with a sample screen.

Fig 2.2: All prototype screens and components.

More detailed views of each section of the prototype can be found in the enclosed Appendix.

Method

Participants

We recruited three participants. Tom is an exchange student from Germany studying history at the UW. He was the subject of one of our contextual inquiries. He does not own a car and is uses the bus to travel everywhere: to school, to the grocery store, shopping, etc. He is an example of a bus-dependent individual. Andrey is a computer science major at the UW who rides the same bus every day to the UW campus. He is an example of a commuter type. Rebecca is an undergraduate at the UW who rides a handful of the same buses. She does not own a cell phone. She is an example of someone who falls in between a strict commuter and a completely bus-dependent individual.

These participants were selected because we expected their varying experiences and backgrounds to lead them to navigate and search for information in different ways. This would show us three completely different approaches to using our device. Incorporating information from Rebecca, who did not own a cell phone, was also a good chance to assess the intuitiveness of our control system..

Environment

Our test environment was a sixth-floor conference room in the CSE building. Participants were greeted and asked to sit at a table, with the "computer" on the table and the human computer-controller sitting directly across from them. The facilitator was seated to the participant's left, while the remained of the group sat to the sides, observing and taking notes. A paper mockup of the control buttons was

placed in front of the participant, with the card representing the current screen placed above it. Highlighted areas and changeable text on transparencies were overlaid on top of the screen card; when the participant depressed "buttons" on the control pad, the screen (or one of the elements) would change.

Tasks

Participants were given three scenarios and asked to perform a task within each scenario. The three tasks followed the tasks outlined in our contextual inquiry document; however, the situations were modified to feel more realistic. We also chose to alter our original second (medium-difficulty) task slightly in order to test a different functionality area of our device. The tasks were as follows:

1. Determine next bus arrival: Participants are "placed" at the bus stop outside Wallingford Center at 10:53 a.m., having met someone for breakfast. They usually ride the #44 to campus, but this is later than usual for them. However, the bus stop has no timetables and nobody else is waiting at the stop. From experience, they know that it takes about 10 minutes for the 44 to reach campus from where they are. They have to meet a professor at 11:20 a.m. and need to determine whether or not they'll make it on time.

2. Find a bus stop and route to get to a destination: Participants are placed outside Broadway Market on Capitol Hill at 2 p.m., having finished buying some coffee. They receive a phone call from a friend saying that they have tickets to a 2:30 movie at Pacific Place downtown; the friend tells them that they think the #7 runs to downtown from there. They are not currently at a bus stop. They are then to make their way to Pacific Place.

3. Schedule a trip in advance: Participants are placed in charge of leading a group of students to Safeco Field for a Mariners playoff game (yes, this is an alternate universe) this coming Sunday (today is Tuesday). Nobody has a car but everyone has a bus pass; everyone wants to get to Safeco Field by 1 p.m., since the game starts at 1:30p.m. Everyone has agreed to meet at the HUB. They are asked to find directions for getting everyone to Safeco Field for the game.

Procedure

Participants were greeted by the greeter, then the facilitator gave a brief overview of the project, its purpose, and general details. The greeter was whichever member of the team recruited the participant; for Tom it was Beltran, for Andrei it was Artem, for Rebecca it was Jeff. Jeff played the role of facilitator and Ryan played the role of computer for all three participants. The rest of the group observed.

Directions for how to operate the computer were given, with the facilitator navigating through a few screens to illustrate how the controls worked. Participants were then told they would be placed in three different scenarios and given a task to perform in each.

For each scenario, the background situation for each scenario was given, and the task specified (e.g. "You need to meet your friend at Pacific Place by 2:30"), after which participants were asked to solve the problem using the device. We must note that we specifically did not limit participants to only using our device; users were also allowed to do whatever they would also do normally. In some cases participants used both our device and current methods (e.g. "I ask the bus driver") in order to perform the specific task. A separate set of screen cards had been created for each scenario, each with information specific to that scenario.

Test Measures

Our main objective in observing participant behavior was to compare the participants' expectations about how the device would work with our own intentions. If participants quickly chose the right menu item for performing a certain task, then we could assume that the item was correctly labeled. We noted any participant actions that ran contrary to our notions of how tasks would be performed.

Whenever multiple ways of accessing the same information were available to the participant, we noted which path they chose. This will help us understand which paths are essential and which can be removed or hidden. We also noted any direct suggestions and questions from the participants, any errors they encountered, common usage patterns, and any instances where they became frustrated with the interface. These will help us identify areas that need improvement, or even things that we hadn't considered that should be implemented.

Results

Tom K. was the first test subject. In the first trial, he used the device and looked at the "Quick Info" section without getting into it. He didn't understand that the time of the next bus displayed was real-time info and so went through the "Bus/Stop Info" menu in order to find the exact information. He found out that the information displayed on Quick Info was in fact what he was looking for. In the second scenario, he went directly into Bus/Stop Info, and filled in the necessary information. He had problems distinguishing between the "Start Point" and "End Point" screens. He seemed pleased when he got the search results. He didn't try to look for new options as the defaults where the best ones for him. He found the 'NEXT' soft buttons on the Start Point/End Point screens inconsistent with the rest of the prototype. In the third task, he went directly into the "Plan Trip" menu and started typing the addresses. This task was easier as he had already performed this just before. The radio buttons were easy to understand but the left/right navigation for the date was not. The main problem he had was in typing addresses.

Andrey S. came next. In the first task, he clicked on the Quick Info menu to get more details about the next bus. He wanted to know if the next bus would be on time further down the route. He didn't find what he wanted in the Quick Info menu, so he went to the Bus/Stop Info menu. After entering the necessary data, he finally had what he wanted. He suggested being able to go directly from the Quick Info to the Bus/Stop Info menu directly (in order to avoid filling in the data). In the second task, he used the Bus/Stop Info and used the hotkeys. He entered the number of the route he was interested in and then checked the stops to know where the closest was (he didn't understand that the default stop was already the closest one). In the third task, he went into the Plan Trip menu. He found that entering addresses was not easy, and that maybe entering locations would be a good idea. When he finally had the trip information, he didn't save it. He memorized it and exited the application.

Rebecca was the last test subject. Unlike the other participants she seemed a bit impatient. For the first task, she looked at Quick Info and decided she would catch the next bus at 11:01. For the second task, she decided to Mark this location and chose current - apparently thinking that would necessary for future reference. She then went to Plan Trip and entered the Current location and then decided she needed to call her friend back to get the address for Pacific place. She scrolled past the time entry and then backed up and entered 2:25. She called her hypothetical friend to ask where a stop might be (her friend tells her it's right outside on Broadway); she then went to the stop and waits for the next bus; after entering the bus she asked the driver where to get off. For the third task she went to Plan Trip, New Trip and Enter Address. She was going to get the address for the UW HUB from the Web, so we broke protocol to tell her that landmarks were OK. She then entered UW HUB for Start and Safeco Field for the End. She entered 12:50 for the time and then scrolled to Su for the date. She looked through Fastest, Least Walking, and Least Transfers and went back to the menu. She selects Current Trip expecting to see it, but the computer told her it was undefined, so she went back to Least Transfers. She decided to re-enter a better time and put in 1:30. She saw there wasn't a better time and decides to tell her friends the info. Again we prompted her to press OK for the detailed itinerary. She tried to scroll to see if there were more options, and then presses OK again to save the trip as "1".

All unedited results as recorded by observers can be found in enclosed Appendix.

Discussion

One area that all participants remarked on was the difficulty of text entry; this was the only gripe voiced by all participants. Perhaps we should evaluate speech as a modality for entering address data. Or find a way to avoid text entry in common cases by providing lists of landmarks or some other interactive system.

Consistency among the screen navigation – specifically how to advance from field to field, as well as how to exit and get to the next screen was pointed out by all three users as an annoyance; the general consensus is that consistency of actions would have improved the user experience. The Start Point and End Point screens were confusing because they looked exactly the same, with only one word different, and thus should be more clearly differentiated from each other. Despite these issues, we were encouraged that all three test subjects indicated they would be very interested in having such a device.

Making users enter names was something participants shied away from; both and Andrey and Rebecca named things "1" just to get through the screen. Because of this we may either hide or even remove the trip naming and location naming options. Andrei recommended that there be a prompt to save trips that were planned and then taken repeatedly. We believe that he wanted the device to unobtrusively name them by start and end of trip.
Things that the experiment could not reveal were the location-enhanced capabilites of the device. In particular, the second task, where users were to find a route and bus stop, was difficult to effectively simulate since users were unable to walk around and interact with the environment; part of the usability of the device is how easy it is to incorporate into riders' regular usage patterns.

Forwarding trips was mentioned by Rebecca as a feature she would want in a device, so we should probably think about ways of doing this. Other (now) obvious improvements would be to prompt the user to enter a landmark as an option to an address or intersection, and to make bus/stop info with the scroll bar a more useful tool by having it show a consistant timetable as it is scrolled from stop to stop. This would show the progress of any given bus and permit an entirely new mode of planning. (Thanks Andrey!) We also need to make it obvious that the Quick Trip info is the real-time tracked times for the bus, not a schedule which typically has to padded out as Metro buses often run late (and occasionally early). Because of this, 2 out of 3 users essentially didn't trust the Quick Info to assure them that the next 44 bus would get them to UW on time and were looking for more info or alternative routing just in case.