Mobile Landmark Identification   P11015

TEAM

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MISSION STATEMENT

The goal of this project is to design a portable device that assists visually impaired and blind persons (VIBP) to select a bus and find it at a bus stop without assistance.

STATEMENT OF THE PROBLEM

In response to the difficulties facing VIBP's with respect to way-finding among bus stops, the primary goal of this project is to design a portable device that assists these individuals in selecting a bus and finding the exact location of that bus at a particular stop. Buses do not wait for their passengers and VIBP's ultimately have a very hard time catching the correct bus and/or making it to the correct bus on time without a significant amount of outside assistance.

This device will enable the VIBP to board their chosen bus with minimal outside assistance. The first phase of the project will primarily focus on the interfacing of the tagging technology chosen with the user interface selected. The combined system will be able to locate buses and guide visually impaired and blind users to the correct buses.

PROJECT OBJECTIVES

| 1 | Identify and locate buses within a certain range of the bus stop.
| 2 | Communicate clearly with the user and give clear direction to guide the user to the correct bus.
| 3 | Convey real-time information about bus arrivals.

CONCEPT

Multidisciplinary Senior Design I
P11015: Mobile Landmark Identification

RFID RADAR WITH AUGMENTED GPS

Detailed Flowchart

2/23/2011
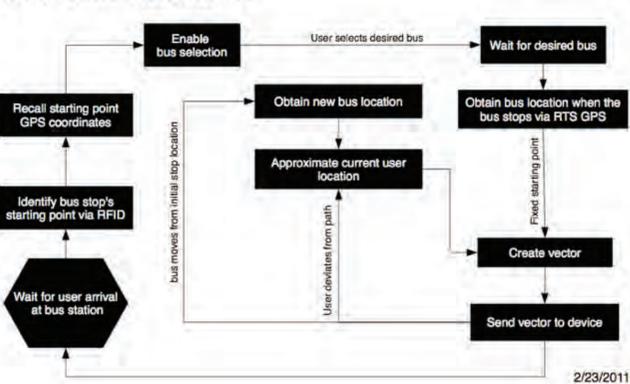
CUSTOMER NEEDS

Device

| Need	Measure of Effectiveness
Portable (if it is modular device)	The device has to be portable compared to existing devices
Hands-free Device	The device supports hands-free capabilities
Time Endurance	The device can operate for long periods of time
Durable	The device is physically durable
Adequate range	The device can operate at an adequate range
Inexpensive	The device is not expensive

Information and Database

Need	Measure of Effectiveness
Multi-platform	The device operates on multiple platforms
Easy to synchronize	The device is easy to synchronize with the existing databases
Accurate information	The information the device downloads is accurate
Real-time arrival notification	The device notifies the user in real-time about bus arrivals

BILL OF MATERIALS

As for the RFID reader and tags, another design team under the same group of assistive devices has purchased those for VIBPs. However, the reader is the Skyetek M9 model, which costs $274.00. The tags are passive RFID tags of different ranges and each bundle (50 tags) costs $100.00.

Component I: Currently In Use

Item No.	Item	Mfg. P/N	Seller	Qty.	Unit Price	Extended Price
1	Netbook	AOD-255E-13647	Radioshack (Store)	1	249.99	249.99
2	Razor IMU	SEN-09623	Robotshop.com (Online)	1	124.95	124.95
3	Breakout Board	RB-Dfr-74	Robotshop.com (Online)	1	15.45	15.45
4	Header	N/A	Goldcrest Electronic Corp. (Store)	1	3.25	3.25
5	USB Cable	N/A	Goldcrest Electronic Corp. (Store)	1	3.00	3.00
						396.64

Component II: Shared with P11016

Item No.	Item	Mfg. P/N	Seller	Qty.	Unit Price	Extended Price
6	Development Kit+Software	SkyeModule DKM9	Skyetek (Online)	1	348.00	348.00
7	RFID Reader	SkyeModule M9	Skyetek (Online)	1	274.00	274.00
8	Antenna	ANT-DB1-VDP-TNC	Linx Technologies Inc. (Online)	1	8.93	8.93
9	RFID Tags	ALN-9634	RFID SupplyChain	1	100.00	100.00
10	RFID Tags	ALN-9640	RFID SupplyChain	1	100.00	100.00
11	RFID Tags	ALN-9654	RFID SupplyChain	1	100.00	100.00
12	RFID Tags	ALN-9662	RFID SupplyChain	1	100.00	100.00
						1030.93

PRODUCT

Razor IMU
FTDI Breakout Board
Mini USB to USB Cable
Netbook
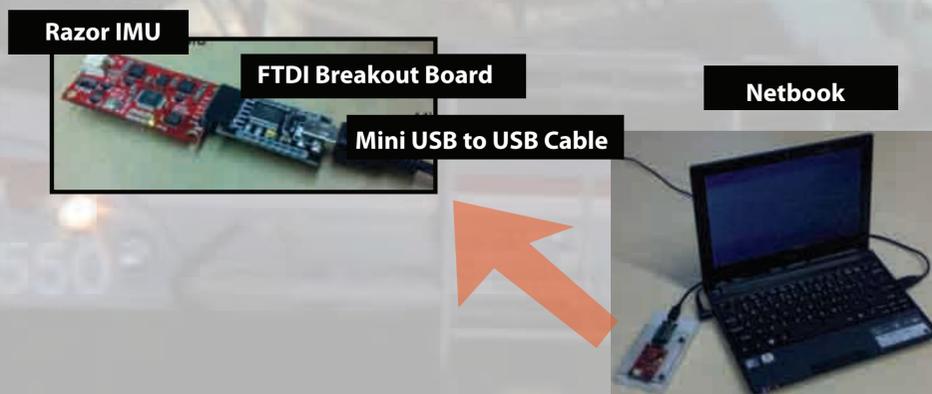
TEST PROCEDURE AND RESULTS

There is a common file shared through the internet that is updated by RGRTA and read in by our program. This common file contains the last GPS location and the last timepoint hit by each bus on the RIT route. When the user enters in the specific bus they wish to take the program finds that bus and watches for an update that the bus reached the bus stop timepoint. The program then waits an appropriate amount of time for the bus to pull over and then reads in the new GPS location of the bus. A vector is then calculated between the bus and the bus stop using their GPS locations to be sent to the device group to guide the user. The code for this section was written using C#.

There are two major components in the second parts of the project;
1) the radio-frequency identification (RFID) technologies and 2) 9 degrees of freedom Razor IMU (incorporates a 3 axis accelerometer, a 3 axis magnetometer, and a 3 axis gyroscope). The RFID system consists of a UHF RFID Reader called a SkyeModule M9 and the RFID tags from Alien Technology. The RFID tags were tested (in both indoor and outdoor environments) to determine the best configuration to notify the user of when he or she is within 1-2 feet of the bus stop.

From the test results, the best practice is to place a 1.5-inch thick piece of wood plaque of a height of about 3 feet on the bus stop pole with RFID tag type D or ALN-Squiggle.

For the other component, C-based firmware code was developed using Arduino software for the Razor IMU to utilize those sensors in order to determine the relative position of the user relative to the starting point. Tests were performed to calibrate those sensors, find the device limitations, and determine the accuracy of the device.
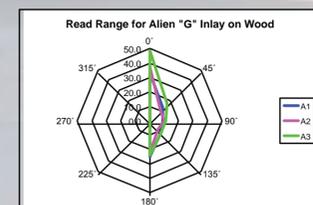

Figure: RFID Testing

Figure: RFID Tag type results for "G" Inlay on Wood

Figure: Test Results for Razor IMU using Arduino software

RESULTS/CONCLUSION

As of now the project is currently in progress. The time frame set for this project by the Multidisciplinary Engineering Design Program is a total of 22 weeks. The team is currently in their 20th week and the current actions being taken are: establishing requirements of and preparing setup for testing all data received from RGRTA; determining and setting up all test procedures, test plans, and post-processing of results.

FUTURE WORK

Eventually there will integration with the other senior design teams in order to shift this device to a smart phone or similar COTS hand-held electronic device.

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