PROXIMIVIEW TECHNOLOGIES

Progress Report for a Wearable Proximity Detector to Aid the Visually-Impaired

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Team Members

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Overview

Over the past two months, the PROXIMIview team has been working diligently on the development of the proof of concept proximity detector to aid the visually impaired. Functional specifications and design specifications have been finalized and currently the team is in the midst of module implementation and integration stage[1].The module integration stage will be followed by the testing stage, which will be carried out under three sections, namely component level testing, integrated system testing and structural/ durability testing[2].

Technical Development

Since the last oral progress report (Thursday, November 10, 2011), PROXIMIview Technologies has made substantial progress in the integration phase of the project. However, after discussion with professor Sjoerdsma and professor Rawicz, as well as several engineering teaching assistants, we have decided to modify our control module from a wearable device to a handheld device. The reasons for this change, as well as the state of the hardware and software components, are outlined below.

Hardware

The hardware consists of two main components:

1) Sunglasses/ Sensor Unit
2) Control Unit

1) Sunglasses/ Sensor Unit
The wearable sensor unit consists of three ultrasonic PING))) sensors mounted on the centre, left side and right side of the glasses. These three sensors will be meticulously wired using 12 AWG 5/20 shielded wires, and the signals will be sent to the microcontroller which will be inside the control unit. This unit is nearly complete, with just careful soldering and insulator wrapping the only remaining tasks to be performed.

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2) Control Unit/Sensing Wand

The control unit consists of the Arduino microcontroller, VoiceShield, battery pack, vibrator module, power switch and an additional ultrasonic PING))) sensor. The design of the control unit was changed from a device that is worn around the waist to a handheld device, or a "sensing wand". This change was agreed upon by the entire team to provide more flexibility and versatility for the user. The wand can still be worn by the user if the user desires their hands to be free, but optimal performance will be achieved by pointing the wand in the direction that the user wants to go to. The additional sensor on the handheld control unit will be dedicated to the vibrator module, thus tactile feedback will be provided only in response to obstacles picked up by the sensing wand. This will allow the user to point the handheld device at objects regardless of height and obtain increasing levels of vibration as the user moves closer to the object. The control unit/sensing wand is currently in development, with fabrication, wiring, and insulation still to be performed.

Software

The software consists of programming the PING))) sensors in accordance with the microcontroller. The three sensors mounted on the sunglasses communicate with the Arduino Uno microcontroller by the C code developed by our software team. Hence the software component of the project deals with getting the proximity values of objects such as walls etc. and hence using the same values for programming the VoiceShield using the Arduino Uno microcontroller. The VoiceShield has been programmed to store various messages depending on the proximity values obtained from the sensors and using the values to output the auditory message to the user. We have also implemented a fourth sensor on the enclosure in order to detect the objects at waist level. The way our software behaves for this sensor is that, it gets the proximity values from the sensor and by the use of several functions, we have enabled the varying intensity levels of a vibrator module for object detection. Therefore, as the person approaches the object the intensity of vibrations on the vibrator module increases and vice-versa. This vibrator module will be embedded within the enclosure. Therefore, the PING))) sensor, the vibrator and the Arduino Uno communicate linearly.

The software also takes into account various sanity checks such as low battery detection, where our code interfaces with the hardware and detects if there low voltage level from the battery and hence has a corresponding "Low Battery" message that is to be heard by the user. Our code also checks if the sensors are working fine and hence there is no loose connections. These tests are to be done in order to make our product robust.

Budget

The project is on track with our projected costs and is within our budget. The completed device is not expected to exceed our budget by more than 10%.

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Human Resources

Our group gets along very well and we have great group dynamics. We meet between 2 and 3 times a week to work on the project, and still find time to succeed in our other courses. We have also been in email correspondence with the CNIB (Canadian National Institute for the Blind) regarding our project, including discussion about whether our device would be something they are interested in reviewing or testing. Lastly, we have been in contact with a personal friend of Gary's who is severely visually-impaired. This individual seems excited about our device and is anxious to test it.

Action Items

PROXIMIview Technologies is making excellent progress in finishing the final proof-of concept model as expected by Dec 15th 2011. Our main agenda now is to complete overall the enclosure, mount a fourth sensor on it and integrate our product with a custom made battery pack. This includes the final integration of our product and improves its aesthetic appeal. Once this is done, we will be doing some final foolproof testing of our proof-of-concept model.

Desired Demo Date

Our group would like to demo our project on December 16, 2011, at 10:30am. Shall this time not be available, we are open to demoing at *any* time on December 16, 2011.

References

[1] PROXIMIview Technologies, "Proposal for a Wearable Proximity Detector to Aid the Visually Impaired", Sep. 2011
[2] PROXIMIview Technologies, "Functional Specifications for a Wearable Proximity Detector to Aid the Visually Impaired", Oct. 2011