Progress Report

Schedule

Over the past several weeks, Envied Solutions has completed phase one of our development of the **WhereTo**, an indoor direction finder system for the visually impaired to self-sufficiently navigate within buildings by the aid of audio cues through headphones.

Successful completion of phase one required defining the entire system's design as well as receiving useable ultrasonic signals from a sensor beacon at an operational distance and being able to extract the encoded information from it.

Successive phases to our project require receiving and processing signals from incrementing number of beacons and further integration.

By now, our progress should be well beyond phase two but system integration, testing, and debugging exceeded our time forecasts. Our strategy to steer us back on track is in the Remediation portion of this report.

Progress

We currently have two streams of activity in progress. On the software side, completed so far, there is the voice recognition aspect to our project by the generation of a sound model for use with ready-made libraries. The selection of voice recognition libraries depended on Linux compatibility and feasibility to operate with the limited resources of a Raspberry Pi device. The combination of Voxforge, HTK, and Julius has good documentation and functions well in our application.

All that remains in software are testing the path-calculator and refining the audio user interface for use in conjunction with the sound recognition suite. User position and path calculation are the major challenges to the software side and the A-star algorithm solves them both. This algorithm is popular in computer AI, especially in games, to determine the shortest route around obstacles to reach a destination. The difficulty is in accurately determining the user's position on the map.

As for the hardware side, most of the groundwork is complete. We began with experiments using low quality ultrasonic sensors and transducers and concluded that choosing ultrasonic technology is feasible. We then moved on to acquire higher quality components and most of them have arrived. Our remaining work is with optimizing the circuitry to transmit clean location signals from our ultrasonic beacons. We are also experimenting with different op amp chips and configurations to seek out one that minimizes noise on broadcast. At the same time, we are also ensuring that we are meeting the requirements for reliability and error as outlined in our Functional Specifications. We are also in the

process of designing and implementing the portable power supply for the handheld device using rechargeable batteries run the chips and microcontrollers.

After we finalize our final design, we also plan to move away from breadboards and solder our product on a PCB board we have prepared. At that time, we will place everything into the shielded enclosures we have designed for beacons and the handheld.

Financial Status

In total, we have spent approximately $370 on components for the prototype system as well $50 for experimenting on implementations for a total of $420. Each of the four signal beacons cost $50 in components and the handheld device cost about $220. Our expenditures breaks down to upgrading our low-quality workbench ultrasonic transducers used to assess the feasibility of ultrasonic signal transfer to better long-range ones for our prototype, acquiring all the Raspberry Pi and Arduino Uno devices as well as their accessories for signal generation and computation, and purchasing the components for the portable power supply.

Group Dynamics

Communication and scheduling of group-work sessions has become challenging as people become busier when exam period approaches but we continue to hold biweekly progress update meetings. We are still dedicated to be successful in the realization of our project.

Remediation

As we have not kept up with our planned pace of work, we are now merging tasks and prioritizing key features over nice-to-have ones. We are also moving towards a continuous integration approach where whenever we have something completed, we will merge it into the main system to immediately see its impact and fix problems as they arise. This course of action is due to the integration process being immensely time-consuming and we simply cannot afford the time to do it all at the end.

Our current development plan is to complete full system integration in one week and then continue with rolling in new modules. The objective here is to quickly iron out defects and reduce the test cycle for the future as our deadline approaches.

In the case that we are still unable to maintain progress at a desirable rate, we will start dedicating entire weekends or more to work in the labs together as opposed to contributing individually. This will allow for the quickest support by fellow team members when we run into obstacles and tough decisions.