

Carryable Device for intelligent path planning to aid the visually impaired elderly.

TEAM: The Thunderstick Squad

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Motivation

Old age is a part of life to be relished ,but as we age, the functionality of various body organs starts to deteriorate and this hampers our day to day activities. Vision is one such area which takes a huge hit with the onset of a more mature age. Various problems like myopia, presbyopia, hypermetropia, cataract are common fare in old people. So, to help the senior citizens with these issues, we plan to develop a system that would be able to aid aged them with the comfort of being able to navigate smoothly enabling them to go to various places without the help of others. The device could be fit on a walking stick enabling navigation through the GPS of the phone with local obstacle avoidance. We plan to codename this stick as *Laathi*, which is simply the Hindi term for the same.

Working Principle

The basic working principles of this device would be the combination of GPS application on an Android phone along with a magnetometer for navigation and the SONAR pings received for local avoidance. The feedback would be from two types of vibrations, haptic and audio. The magnetometer would be used to provide yaw angle value to the magnetic north. The processing would completely be based upon a 8-bit Arduino Uno R3. The application, based upon Google Maps would calculate the most suitable path, using the usual algorithms of Google Maps. Then the stick would act as a virtual eye to the person. It would guide the person to the path already planned via the application, and the SONAR module would detect obstacles if any in the way. The design would be completely integrated into a regular walking stick. The

application would first receive instructions for the end point, and then the Arduino would communicate with the phone via a bluetooth module.

Detailed Working Analysis

The stick would have a dock for the accompanying phone or the person can simply carry the phone in his pocket. The phone would house a custom built Google maps based application that always calculates the path from the current position. The app would be built using simple App Inventor or App Studio, and would be quite comfortable to use for anyone. The final destination would be sent in the form of GPS coordinates or final location in the form of a message from an IP:Port. The final destination would then be used as the end point for the current navigation. Then the phone would start beaming, via bluetooth to the Arduino, the correct direction that has to be traversed. It would send only the heading angle with respect to the north axis. The magnetometer would keep recording the real time heading angle and would keep sending a haptic feedback whenever the magnetometer (real time) heading matches the correct value of heading. Then SONAR also monitors real-time data of the nearest obstacle. Whenever the obstacle distance is less than 1m, then the SONAR sends a piezo buzzer into action. So the user gets an alert whenever an obstacle is nearby. Also the red LED lights up, indicating visual impaired-ness of the person to the people.

The entire code would work on an Arduino Uno R3 board. There would be a provision for a troubleshoot mode whenever the *Laathi* falls down unexpectedly which can be realised using an accelerometer. Then a buzzer would start beeping, indicating the position of the *Laathi*, allowing anyone to help or the visually impaired to help himself.

Overall, we feel that the *Laathi* could be a new kind of an aided echolocation device, helping the needy in more than one ways. The concept is low cost, low power, long lasting and durable. The prototype can easily be built in under Rs. 2000.

Here's a picture of the model as it would look when complete. The final product may look different although.

