Smart Stick

Team Members Khyber Lahori, Marshall Robert Rajczak, Josh Arhebamen, Peter Haddad, Gabriel Karkaji

# Project Description

Our project is going to be remaking a white stick for the visually impaired. Our version of the stick will be able to detect obstacles in front of the user and will warn the user by beeping. Since the sensor to detect objects will be placed around the middle of the cane it will provide additional functionality than the white cane. This is because the user will be able to detect objects such as a table where the object is lifted from the ground.

Another feature of our stick is that it can help give the user directions to their set destination. This will be done using GPS from the users phone and relayed through the phones speaker.

Our device will also be able to detect the walking sign on the pedestrian signal., The cane will notify the user if it is safe to cross through the users phone speaker.

Of course, given time we could also add many other features for this device to help the visually imparied but for now the main features that we want to have on the device are the ones we listed above.

# Project Rationale

With technology moving at such a fast pace the world around us seems to be always changing however one thing that has always remained the same is the white stick. It has not changed since it was invented in 1921. With 39 million people being blind world-wide we believe that this innovation will change the game forever. We want to make it easier for the visually impaired to navigate and as well as ensure their safety.

Rather than having the visually impaired struggle to get from point a to point b, we would like to ease their minds. We want to build a device that is long lasting and effective; something that will be around for years to come. A device that can be the eyes of the visually imparied. Features like object detection would help reduce the fear of hitting something. Also pedestrian signal recognition will help the user recognize when they can cross and avoid human error to prevent the user from crossing the street an unsafe times. Of course these are just a few of the things we will be implementing in the Smart Stick to help ease the mind of the visually imparied while also keeping them independent..

# Personal/Professional Expectations

As a whole, we want this project to be successful and bring a breath of fresh air to the technological community. If we can reduce the injuries or deaths due to the lack of ability of the standard walking stick, we would consider this a success. The more people benefit from this project and are inspired by our design, the better it is for everyone.

Professionally we would hope to gain experience in teamwork as we work together over the next 8 months on this project. We would also like to learn how to interface the sensors we need for our project with the raspberry pi. As well as be able to use the data we get from the sensors to produce a useful output whether it as simple as making a motor vibrate or as complicated as image recognition.

# Project Goals

The main piece of our project would be the Raspberry pi 4B this would be the brain of our project and will be used to interconnect all the inputs and outputs

* Object detection

Using an Ultrasonic sensor to detect objects in front of the user then sending a signal to the users phone

* Pedestrian signal recognition

Using a camera and image processing, our device will be able to recognize the walking symbol on a pedestrian signal and once that image is recognized it will tell the user that it is safe to cross the street. It may notify the user by a different vibration or sound.

* GPS

Using a bluetooth module to connect to the users phone we would like to have the user press a button then provide an address. Using an app on the users phone that would have open source speech recognition and google maps API the stick would give the user directions as to where they would need to go in order to reach their destination.

# Research

Most of our research was done using multiple search engines on the Internet. We were able to find a few projects similar to what we were thinking of doing and only one company known as WeWalk that was selling a “smart cane” for $499.One thing all those projects had in common was it only had a device for object detection and a few also incorporated a gps into the project. This is where our project will be different from all of those projects since our cane would be using a camera and image processing to recognize the walking symbol on the pedestrian signal letting the user know exactly when it is safe to cross the street

# •​Procedure

Resources required include ultrasonic sensor, raspberry pi, lidar sensor,battery, charger, micro sd card(we plan on getting these parts from the lab guy however since he may not have everything we need we plan on going online to sites like amazon and digikey as well as local electronic shops for the missing parts.)

*Phase 1 (To be completed end of October)*

-Get Object detection to work on raspberry pi

-Have user phone and raspberry pi connected through bluetooth

-Cause a beep on the phone when an object gets in range on the device

*Phase 2 (To be completed mid January)*

-Interface the camera

-Learn how to use an open source speech recognition software

-Learn how to use open source software like tensor flow for object recognition

-Get our device to be able to recognize the walking symbol on a pedestrian sign

-Have users phone talk when it sees the walking symbol on a pedestrian sign.

*Phase 3 (To be completed mid March)*

-Learn how to use an open source speech recognition software

-Learn how to use google maps API

-Use the raspberry pi with speech recognition software and have it recognize the words we say into the mic

-Implement the google api and gps on the phone to give directions to where we want to go

*Phase 4 (End of second semester)*

-Add any additional features or improve the existing features

-Work done in this phase will depend on how quickly the previous phases are completed

# Evaluations

In order to evaluate our project we would need to have all the main features or a version of them in our smart stick. Therefore the users phone would have to beep whenever there is an object that is getting close to the user within the range of object detection. This feature could be easily tested by simply having someone walk by the stick and seeing if the phone beeps as the person gets close to the stick.

In order to test the Pedestrian signal recognition on our device we will print an image of the walking symbol on a color printer and see if the camera on the device is not only able to recognize the walking symbol but also if it is able to tell the user that it is safe to walk. This will tested a number of times with the image in different locations each time.

In order to test the GPS we would have provide an address. If successful our stick will give us directions from google maps through the speaker in order to reach our destination.