

# Designing a navigation system for the Visually impaired

## Team members

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## Project Description

The objective of the project is to design a navigation model that could benefit the visually impaired to navigate safely in an unknown environment. Our model aims to replace the conventional methods like the cane used by the visually impaired to navigate in an unknown environment. We aim to create a model that could be attached to a wearable accessory like attaching them to the person's sunglasses, to their coat or may be to any other form of accessory that a person would wear. Even though we have not planned on a specific accessory to fit our model to wearable accessory to help alleviate the involvement of a less useful accessory like a cane.

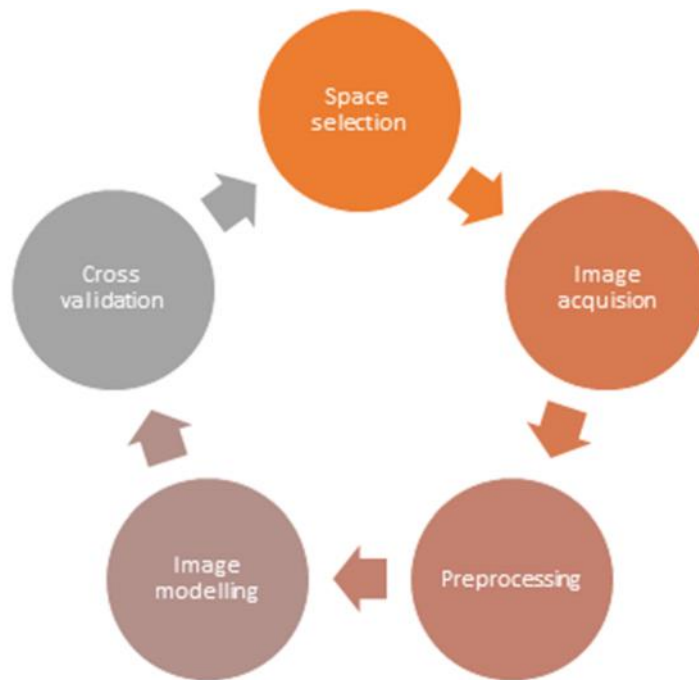
The steps in creating the model would involve the following steps

**Space selection** - We would have to select the space which we would create our model on. Since there are only two possibilities one being indoor and other being outdoor. For the purpose of our study and keeping in mind the time and resource constraints we would restrict to detecting indoor objects.

**Acquisition of image data** - This step would be critical because this is what our model would train on. We would consider the common object images in an indoor space. .

**Model** - This would involve developing a model that would train on the acquired image data, detect objects in the defined scene and use an actuator that could direct information about the object to the system. The system would classify the object in the scene and would alert and provide a directional whereabouts instruction of the location of the object so that the user could be well informed of their surroundings. The aim of our model would be to create a vicinity map that could enable the user to navigate in an environment containing different real world objects

**Test** - One process of testing the model is to actually train on the part of the image data that we had selected and do model level cross validation on the test data available. Real time testing would be to use the system in a different indoor environment with different designs of the same object to see how well the object can adapt to the different indoor space.



**Fig 1:** Process flow (tentative)

## Reading List

The following are some of the papers that we read to get a basic idea about the tasks we need to cover to create a navigation model in our space

YingLi Tian, XiaodongY ang,Chucal Yi and Aries Arditi, Toward a Computer Vision-based Wayfinding Aid for Blind Persons to Access Unfamiliar Indoor Environments

Young Hoon Lee, Gerard Medioni, RGB-D camera based wearable navigation system for the blind, Computer Vision and Image Understanding 2016

Anguelov D, Koller D, Parker E, Thrun S. Detecting and modeling doors with mobile robots. Proceedings of the IEEE International Conference on Robotics and Automation. 2004

## Research Plan and Timeline

Process	Description	Team member	Completion date
Image acquisition	Involves collecting images from an indoor space so that we could collect the data that is necessary for modelling	Arun Ram, Raghavendra	03/15/17
Preprocessing	Involves selection of images , reduction of noise and feature extraction for modelling	Ganesh	03/25/17
Data Modelling	Involves training and modelling the data. Involves modelling our data using models like Bag of words, SVM and CNN	Arun Ram , Ganesh, Raghavendra	04/15/17
Test	Involves testing our model using cross validation. Evaluating and comparing our model results using accuracy and precision metrics.	Arun Ram, Ganesh , Raghavendra	04/25/17

## Evaluation

The evaluation of the success of our project would be based on the following

- Accuracy

- Precision

- Recall

- Ability of the model to adapt itself to a different environment with the same set of objects but of a different model or shape

## Data

The data that we would use is the real life image data from three different indoor environment

- Indoor space with n distinct objects

- Indoor space with n same objects

- Indoor space with n repetitive objects ( Eg: 10 chairs, 3 tables and 2 windows )

The camera that we would use to collect these images is the Canon Rebel T5. We plan on training on a collection of 1000 images collected from this device.