1. Resource Title: An Indoor Positioning System Based on Static Objects in Large Indoor Scenes by Using Smartphone Cameras

Authors: Aoran Xiao , Ruizhi Chen , Deren Li Yujin Chen and Dewen Wu

Link: <https://www.mdpi.com/1424-8220/18/7/2229>

Synopsis:

In this paper, they did static object detection in Large indoor scenes by using Smartphone cameras. They have integrated algorithms of deep learning and computer vision. Here, they have adapted Faster-RCNN algorithm in order to detect obstacles such as- Doors in indoor environment. They have calculated the performance of static object detection, by adopting the strategy of transfer learning, and retrained the network by using training images on the basis of model trained by ImageNet. Using the cross-validation method, they randomly selected 50% of images for training, 25% for testing, and 25% for validation.

The research presented in the paper is relevant to our project, as they have implemented Convolutional neural network, which is relevant to our project. We need to detect doors and stairs, which can be implemented using Faster-RCNN algorithm, as proposed in the paper. Faster-RCNN integrates region proposal, feature extraction, classification and rectangle-refine into one end-to-end network, which greatly reduce the amount of calculation and speed up the detection process. Also, the best thing about Faster-RCNN algorithm is it also provides bounding box over images, once it detects the object. We may also have to click images for the test dataset. Along with it, we will be using Coco dataset to train images. With the help of this paper, we could be able to achieve the first task of our project i.e., Classification of doors and stairs in the Indoor environment, along with bounding box regression over detected objects classified as- doors and stairs.

2. Resource Title: Staircase Recognition and Localization using Convolution Neural Network (CNN) for Cleaning Robot Application

Authors: Muhammad Ilyas Anirudh Krishna Lakshmanan Anh Vu Le and Mohan Rajesh Elara

Link: <https://www.preprints.org/manuscript/201812.0296/v1>

Synopsis:

This paper describes a deep learning approach using Convolutional Neural Networks (CNNs) based Robot Operation System (ROS) to staircase recognition and localization. In the paper, they localize these staircases using a contour detection algorithm to detect the target point, a point close to the center of the first step, and the angle of approach to the target point. Experiments are performed with data obtained from images captured on different types of staircases at different viewpoints/angles. Results presented in the approach is very accurate in identifying the presence of a staircase in the working environment and is also able to locate the target point with reasonable accuracy. They have trained their network on the images from Coco dataset, which is a large data-set containing 80 most common classes for labelling. They have also used a RMS prop optimizer for loss optimization with initial learning rate 0.004 and a decay factor of 0.9.

The information presented in the paper is relevant to what we are trying to do in our project, that after classifying stairs, if a low-vision person has to approach to the stairs, they need to know the first step of stair, in order to traverse the stairs. Since they have used Coco dataset, thus they have trained images at a huge amount, and thus will be quite beneficial, while testing images on real-time scenarios. They have also used Deep learning approach to classify stairs in image, using MobileNet and SSD architectures, which is better for smartphone cameras.

3.Resource Title: Monocular SLAM and Obstacle Removal for Indoor Navigation

Authors: Shibo Han , Minhaz Uddin Ahmed , Phill Kyu Rhee

Link: <https://ieeexplore-ieee-org.proxylib.csueastbay.edu/document/8614006>

Synopsis: This paper aims at removing the obstacle to enhancing the indoor navigation system performance based on popular open-source framework ORB-SLAM2 in a dynamic environment. One of the approaches mentioned in the paper to remove the obstacle in the real environment is by using the convolutional neural network (CNN) to generate a segmentation mask of obstacle objects to eliminate interference by moving objects.

We are interested in the basic framework of Mask-RCNN and the actual application effect on the local dataset and benchmark dataset that is mentioned in this paper for obstacle avoidance.