ECNG 3020 Project Proposal 2020/2021

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Project Title : AI Navigation System for the Blind/Visually Impaired
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Project Category : Type IV: Investigate and Design
Thematic Group : Computer Systems, Electronics, Artificial Intelligence
Project Keywords : Deep Learning, Computer Vision, Embedded Systems

1.1 Background

A blind person normally uses a cane to navigate from one place to another. While the cane is helpful, it is very limited in determining the terrain and type of obstacles in the path of movement. Therefore, it would be useful for the blind person to have a device that can identify the type of object, the distance from objects and even recognise the face of individuals. This device would be a significant game-changer in the blind and visual impaired community.

1.2 Objectives

Build a device that uses machine learning and artificial intelligence to assist a blind person in navigating an environment. The device should be able to do the following:

1. Identify objects/obstacles in the path
2. Estimate the distance from an object
3. Provide auditory and/or tactile feedback to direct the user
4. Accept voice commands (stretch objective)
5. Conduct facial recognition (stretch objective)

1.3 Implementation and Methodology

The system should be implemented with a computer/processor(smartphone, raspberry-Pi, etc), camera, distance sensors, vibration motors, speakers, microphone, etc.

1.4 Summary of Requirements

1.4.1 Prerequisite Skills and Knowledge

To successfully complete this project student should develop knowledge in embedded systems development, Machine learning and artificial intelligence, computer interfacing, programming in a computer environment (Unix/Android).

1.4.2 General Hardware Requirements

Hardware required for this project includes a small computer, camera(depth sensing or otherwise), speaker, microphone(for stretch objective).

1.4.3 General Software Requirements

Software required for this project includes embedded system software development application, computer vision applications such as OpenCV, machine learning frameworks such as Tensorflow, PyTorch, Keras and general software applications/environments such as Python and Linux/Unix.