# Obstacle Detection for the Visually Impaired

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**Keywords**

Obstacle Detection, Internet of Things, Distance Sensor, Vibration Patterns, Haptic Motor, Raspberry Pi

**Abstract - Obstacle Detection for the Visually Impaired is an Internet of Things application as the name suggest for visually impaired people to detect an obstacle while walking. This application also helps visually impaired person to determine whether the object which is in his way is in motion or not if the distance between the person and object is reducing continuously then that person will be able to determine it. So how it works is when some object happens to be in the way it will alert the user by using vibration. We used distance sensor to detect the distance between the user and the object. Also, we used different vibration patterns according to the distance of object to set different vibration patterns we used microcontroller. Addition to that we used a haptic motor as a vibrating device. For the computation purpose we used Raspberry pi and to power up the project we used 5V power bank.**

**Concepts**

Internet of Things, Object Detection

## I. Introduction

Internet of Things plays an important in our day-to-day life nowadays. But still we didn't unleash some important aspects like voice recognition systems which we can see everywhere nowadays. Other examples also include using them in a delivery of an item companies like USPS and DHL using IoT to deliver their products within small time frame also cost efficiently. The sport broadcasting companies also use IoT to make user experience better. But in this project, we decided to use IoT for impaired people who can use it to see things, use to move, use to do something. Though the visually impaired user may not be able to see things, but he may have good sense a minor change happening around so decided to use that to create vibration pattern to detect the distance between object and the user. For that we can 2 approach by using image processing or by using proximity or distance sensor but using image processing can be expensive as we need to use camera with expensive and time-consuming algorithm to detect an obstacle, so

we decided to use distance sensor for this project.

Section 2 describes design and technologies used to design and to create Obstacle Detection for the Visually Impaired project.

## II. Design and Implementation

### A. Overall Design

The proposed and implemented system design is given in diagram below-

1) Raspberry pi
2) Distance Sensor VL6180X
3) Motor Controller DRV2605L
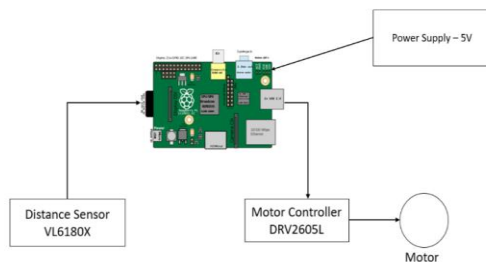4) Haptic Motor
5) 5V Power Supply



Fig. Design Block Diagram

We used Raspberry pi to program the distance sensor microcontroller. For the programming purpose we used python as a programming language. So, the design includes power supply of 5V to power the whole system the project also includes hand embedded haptic motor. To detect the obstacles, we used distance sensor from Adafruit Industries named VL6180L which detects an object with a range of 255mm and to set different vibrations patterns we used motor controller DRV2605L which is connected to haptic motor. The motor controller plays an important role in the project as it consists of 100+ different vibration patterns for the user to detect an object with the range of sensor.

### B. Algorithm

The algorithm we used for our project to detect an obstacle in the way of user and vibrate accordingly –

1. **Apply the libraries for both sensor and microcontroller in python.**

2. **Detect the object using sensor**

   **If (object > 255):**
   **Run python code for microcontroller**
   **Else:**
   **Do not vibrate**

3. **Run the code haptic motor according to the distance using different patterns**

## III. EVALUATION

Internet of Things playing an important part in people's life. But it's impact in lives of imparted people is limited. So, we decided to build an application that will help them. While working on that we find that it has many advantages which are explained below-

The first advantage is it helps the visually impaired user will be able to determine the distance between him and the object by using different vibration patterns as already mentioned before the visually impaired people have a better sense of vibrations then others so once they understood the pattern of vibrations, they will get notified way before they came close to obstacle.

The second advantage of using this application is that if the object is in motion the user will be notified in advance that the object is coming towards him or he is moving to towards the obstacle. So, he needs to change the path he is moving on. It also helps him know that the object be a human being, a bird or a moving non-living object.

The third and final advantage is that it's really an inexpensive solution as it costs less than $60.

Kindly follow the following link for a YouTube video demonstration –

https://www.youtube.com/watch?v=7qcI9_4u_wE&t=28s

## IV. CONCLUSION

The main proposed aim of this project was to develop an Internet of Things application to help visually impaired user detect an obstacle in his way. By simply using IoT network consists of distance sensor, microcontroller, haptic motor, Raspberry pi, and power bank to supply the power. To communicate the system with another component we used python programming. Also, for sensor and microcontroller data access we used breadboard followed by connections with the raspberry pi. And to sense an obstacle and vibrate accordingly we used Adafruit libraries.

### References

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