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# Problem Statement

For blinds, it is difficult to walk and know their surrounding without the help a stick. This Project aims at assisting blind person to move around without a stick and enable to recognize important objects.

# Solution

The basic principle is to detect presence of obstacles using multiple ultrasonic sensors and give feedback in vibrational form. Also, important objects can be recognized using camera. This object information can be conveyed to the person using stereophonic sound.

We can divide this solution in two parts:

1. **Obstacle avoidance**

   To detect obstacles while walking in forward direction, we will use 4 ultrasonic sensors. These sensors will be mounted around the belt arranged in different orientation. Output from these sensors will be processed in a microcontroller and suitable vibrational feedback will be provided. To provide vibrational feedback, 4 small vibration modules will be placed around waist. Depending upon the output of ultrasonic sensors, necessary vibration modules will be activated to inform the person about direction of the obstacle.

2. **Object recognition**

   Camera will detect the presence of an object and if the object is present in that frame then beep tone will be played. To know where the object is, stereophonic sound will be used. For example, if the object is found in the right-half of camera frame then stereophonic sound will be played more on right side. This will indicate to a person that the object is present towards his right. Once he starts turning towards right, object will move to the center in the camera frame. This will play stereophonic sound on both sides almost equally to indicate the presence of an object near the center of camera frame i.e. in front of a blind person. As he moves closer to the object, beep frequency will be increased.

Object recognition algorithm will be implemented in OpenCV on BeagleBoneBlack(BBB). All ultrasonic sensors will be interfaced to BBB which has built-in 8 channel 12-bit ADC. Depending upon sensors' data, BBB will activate necessary vibration motors.

## Components and Cost

Following components will be required:

| Component | Quantity | Cost (Rs.) |
|---|---|---|
| Ultrasonic Module HC-SR04 | 4 | 219 X 4 = 876 |
| VPM2 Vibrating Disk Motor | 4 | 210 X 4 = 840 |
| HP webcam 1300 | 1 | 820 |
| BeagleBoneBlack | 1 | 3900 |
| **Total** | | **6436** |

## Rough Timeline

| | |
|---|---|
| Week 1 | Learn about BeagleBoneBlack for interfacing camera. |
| Week 2 | Interfacing ultrasonic sensors and vibration motors to BBB. |
| Week 3 | Obstacle detection |
| Week 4 | Object detection using BBB |
| Week 5 | Putting all together |