NAVIGATOR FOR VISUALLY IMPAIRED PERSON

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INTRODUCTION

Globally, At least 2.2 billion people have a near or distance vision impairment.

In at least 1 billion or nearly half of these cases, vision impairment could have been prevented or has yet to be addressed.

In another way, Creating a fusion of sensing technology and voice-based guidance system, products can be developed which could give better results than individual technology.

Figure: Blind Person

PROBLEM STATEMENT

The "*National Blindness and Visual Impairment Survey 2015-2019*" was conducted to provide evidence about the present status of blindness and visual impairment in India. The survey was planned by the Ministry of Health and Family Welfare, Government of India.

- Blindness was **higher among illiterates** compared to the literate population.
- Maximum prevalence of **blindness was seen in 80+ age group** , followed by 70-79 age group , 60-69 age group and 50-59 age group.
- Important barriers were financial constraints , the need for surgery not felt , and fear of surgery. Among males, the most important **barriers were financial constraints** and local reasons. Among females, local reasons and financial constraints were the most important barriers.

LITERATURE SURVEY

IEEE ID	NAME	PROPOSED WORK	DRAWBACKS
ISBN:978-1-5386-2456-2	Smart Cap Wearable Visual Guidance System For Blind.	Tensor Flow API for object detecti-on. OpenCV helps in the image processing operations.	Not capable of recognizing objects near that person.
ISBN:978-1-7281-1322-7	Smart Assistant Navigation Devices for Visually Impaired People.	A smart glass and a smart pair of shoes by integrating various sensors with raspberry PI.	This device is based on internet connectivity hence it is not reliable.

Table: Literature Survey

LITERATURE SURVEY

IEEE ID	NAME	PROPOSED WORK	DRAWBACKS
ISBN:978-1-5386-9471-8	Smart Eye for Visually Impaired-An aid to help the blind people.	Voice-enabled system that would direct visually challenged people in their day-to-day work.	Difficult to identify objects at ground level.
ISBN:978-1-7281-5197-7	Smart Stick For Blind People.	Solution for blind people by using an the ultrasonic sensor in the blind stick.	They can't detect obstructions that are hiddenl.

Table: Literature Survey

BLOCK DIAGRAM

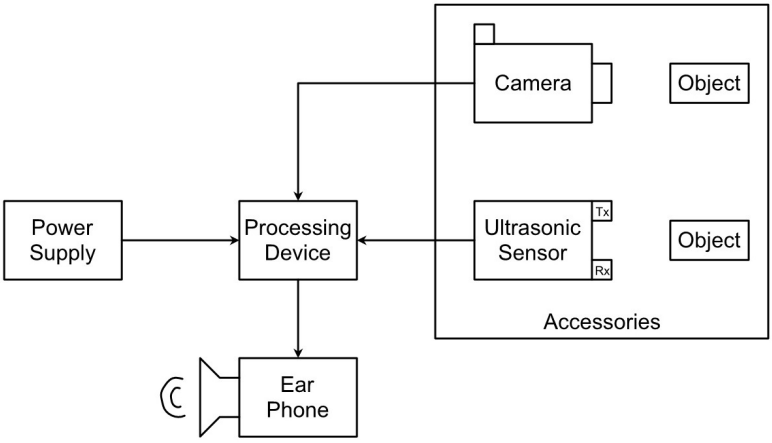

Figure: Block Diagram

BLOCK DIAGRAM DESCRIPTION

The block diagram consists of camera unit, sensor unit, processing unit, power and output unit.

- The **Camera Unit** is responsible for capturing objects while the sensor unit provides the distance of object from unit.
- The **Processing Unit** plays an important role in detecting and identifying objects (image processing) ,it also receives data from ultrasonic sensor then instruct the user about object identified and distance it is located at (So the user can navigate accordingly).
- The **Output Unit** provides output to user in terms of audio signal using ear phones.

FLOWCHART

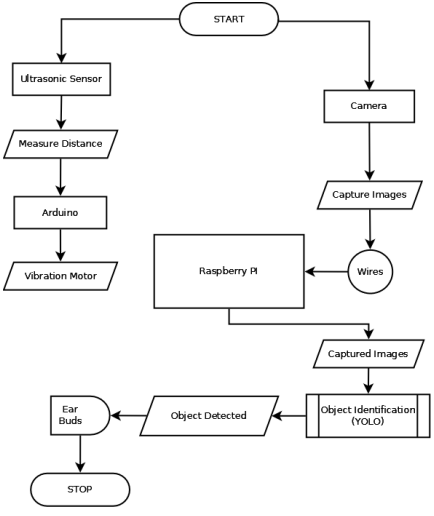

Figure: Flowchart

WORKING

1. The Raspberry PI camera start capturing the frames, after the command is being issued by Raspberry PI.
2. The Raspberry PI will process this captured frames to identify and detect objects using YOLO algorithm.
3. At the same time, Along with identification and detection of objects it will also measure its distance.
4. The object with less distance will be given priority for further processing.
5. Simultaneously, Ultrasonic sensor along with Arduino UNO will calculate distance and notify user about closer objects with the help of vibration motor.
6. The objects detected by YOLO algorithm will be made available to the user in form of audio signal through ear buds.

CODE

```
import cv2 as cv2
import numpy as np
from matplotlib import pyplot as plt

def get_output_layers(net):
    layer_names = net.getLayerNames()
    output_layers = [layer_names[i - 1] for i in net.getUnconnectedOutLayers()]
    return output_layers

def draw_prediction(img, class_id, confidence, x, y, x_plus_w, y_plus_h):
    label = str(classes[class_id])
    color = COLORS[class_id]
    cv2.rectangle(img, (x,y), (x_plus_w,y_plus_h), color, 2)
    cv2.putText(img, label, (x-10,y-10), cv2.FONT_HERSHEY_SIMPLEX, 0.5, color, 2)

image = cv2.imread(r"test.jpg")
plt.imshow(image)
plt.show()
Width = image.shape[1]
Height = image.shape[0]
scale = 0.00392
classes = None

with open(r"yolov3.txt", 'r') as f:
    classes = [line.strip() for line in f.readlines()]


COLORS = np.random.uniform(0, 255, size=(len(classes), 3))
#
net = cv2.dnn.readNet(r"yolov3.weights",
                      r"yolov3.cfg")
blob = cv2.dnn.blobFromImage(image, scale, (416,416), (0,0,0), swapRB=True, crop=False)
net.setInput(blob)
outs = net.forward(get_output_layers(net))
class_ids = []
confidences = []
boxes = []
conf_threshold = 0.5
nms_threshold = 0.4
print(image.shape)

for out in outs:
    for detection in out:
        scores = detection[5:]
        class_id = np.argmax(scores)
        confidence = scores[class_id]
        if confidence > 0.5:
            center_x = int(detection[0] * Width)
            center_y = int(detection[1] * Height)
            w = int(detection[2] * Width)
            h = int(detection[3] * Height)
            x = center_x - w / 2
            y = center_y - h / 2
            class_ids.append(class_id)
            confidences.append(float(confidence))
            boxes.append([x, y, int(w), int(h)])

indices = cv2.dnn.NMSBoxes(boxes, confidences, conf_threshold, nms_threshold)

for i in indices:
    box = boxes[i]
    x = box[0]
    y = box[1]
    w = box[2]
    h = box[3]
    draw_prediction(image, class_ids[i], confidences[i], round(x), round(y), round(x+w), round(y+h))


cv2.imwrite("object-detection.jpg", image)
plt.imshow(image)
plt.show()
```

Figure: Code for object detection and identification

CODE

```
const int pingPin = 7; // Trigger Pin of Ultrasonic Sensor
const int echoPin = 6; // Echo Pin of Ultrasonic Sensor


void setup()
{
  pinMode(13, OUTPUT);
  Serial.begin(9600); // Starting Serial Terminal
}

void loop()
{
  long duration, inches, cm;
  pinMode(pingPin, OUTPUT);
  digitalWrite(pingPin, LOW);
  delayMicroseconds(2);
  digitalWrite(pingPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(pingPin, LOW);

  pinMode(echoPin, INPUT);
  duration = pulseIn(echoPin, HIGH);
  cm = microsecondsToCentimeters(duration);

  Serial.print(cm);
  Serial.print("cm");
  Serial.println();

  if( cm < 100 ){
    digitalWrite(13, HIGH);
  }
  else{
    digitalWrite(13, LOW);
  }

  delay(100);
}

long microsecondsToCentimeters(long microseconds)
{
  return microseconds / 29 / 2;
}
```

Figure: Code for Arduino

OUTPUT

Figure: Before

Figure: After

OUTPUT

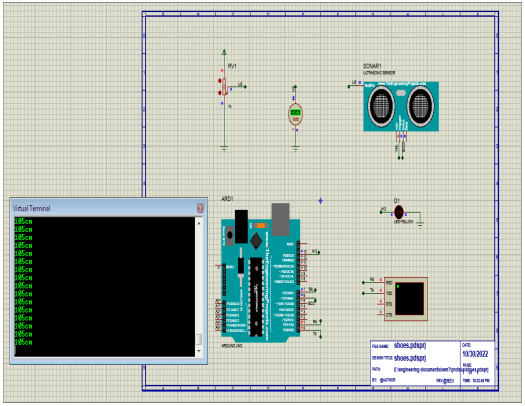

Figure: Before

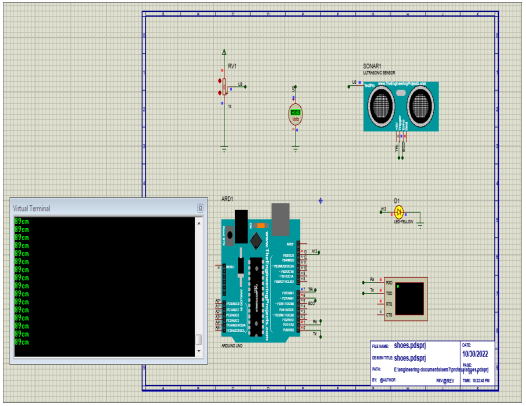

Figure: After

COMPONENTS

Figure: Raspberry PI Zero

Figure: Raspberry PI CAM

Figure: Ultrasonic Sensor

Figure: Arduino UNO

Figure: Vibrating Motor

Figure: Wires

COMPONENTS

Figure: Battery

Figure: Ear Buds

ADVANTAGES AND APPLICATIONS

ADVANTAGES

1. Both indoor and outdoor navigation are possible with the device.
2. Detects obstacles and notifies the blind person through vibration and speech production.
3. The devices placed are comfortable and easy to handle.

APPLICATIONS

1. It can be used for providing a set of useful features :- light detection, color detection, object recognition, and banknote recognition

CONCLUSION

Visually impaired people faced many problems in their daily life, and while traveling they always depend on any person or guide dog. Blind Stick is very helpful for them but Stick has certain restrictions. We created a navigation device for visually impaired people so that they can perform their daily tasks.

There are certain Devices already available in the market but they cannot solve the actual problem. Our project is an integrated system of those devices.

In this paper, We present wearable Accessories in the form of Smart Glasses and Smart Shoes for visually impaired people to deal with their Tasks. Smart Glasses Capture images in front of those objects and recognize them and convert it into an audio form which is then sent to the earphones.

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2. Arjun Pardasani, Prithviraj N Indi, Sashwata Banerjee, Aditya Kamal & Vaibhav Garg, “Smart Assistive Navigation Devices for Visually Impaired People”, ISBN:978-1-7281-1322-7.
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THANK YOU