e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
Volume:03/Issue:06/June-2021 Impact Factor- 5.354 www.irjmets.com

VIRTUAL VISION FOR BLIND

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ABSTRACT

The millions of blind people in this world are always or sometimes in need of helping hands. But looking at the point of Blind people, whatever advanced technology they have, they may not operate because they don't have the ability to see and use the devices. Not only devices, they are dependent on other people completely for each and every small task. In order to fullfill the above missing parts of the blind people, the proposed embedded device with technology that is advanced and which will allow the person to do their own work rather than being dependent on others.

Keywords: Yolo Algorithm, Object Detection, Opencv.

I. INTRODUCTION

'Virtual Vision For Blind' is a solution and support for blind and visually impaired people's mobility indoor and outdoor this work proposes a simple electronic guidance embedded vision system which is configurable and efficient. The proposed guidance system is able to determine the distance of the obstacle, in addition to material and shape characteristics of the obstacle. Along with that, our system can name some of the detected objects. The proposed system is implemented by using raspberry pi, infrared sensors, sonar sensor and camera as one of the main hardware component, python is used as a main software tool and to program the hardware and OpenCv is used to setup and run the object detection model with python. The system has 3 separated components, sonar sensor, infrared sensor and camera which work simultaneously. Python is the base handling the sonar and infrared sensors. For object detection, OpenCv provides framework for python to control the camera and perform object detection.

II. METHODOLOGY

We have designed a system that helps the visually impaired human to move and in the real world as a normal human being. This is achieved by actually telling each and every object present in front to blind person. Our system is combination of three different components namely: Infrared Sensor, Ultrasonic sensor and camera. All these three components of data is sent to raspberry pi which processes data and the output from the raspberry pi is given to the user. The similar structure, implementation, and execution is done for sonar and infrared sensors. Different structure and algorithm is used for camera work. The features of the system include:

- Detect the distance of the object (sonar and infrared sensors).
- Detect the direction of the object based on the sensor that detects the object.
- Detect the type of the object (using object detection algorithm).
- Convey the output to the user through headphones.

III. MODELING AND ANALYSIS

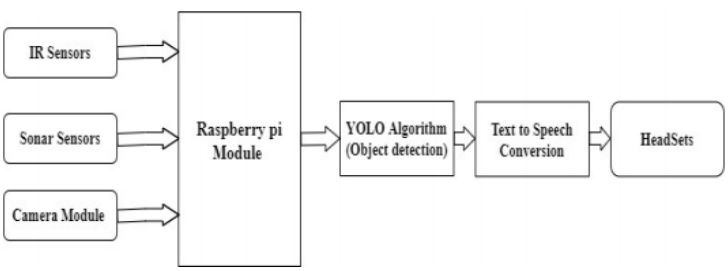

Figure 1: Block Diagram

Above diagram shows the block diagram of the system. It clearly indicates the modules present in the system. This project proposes the design of portable AI based guidance system for blind. It provides the visually impaired community a new way to visualize the world by explaining them about their surroundings. The whole system is controlled by an electronic system. As the system have used maximum capabilities of Raspberry Pi computer which has enough potential to up hold the system with one advantage being the inbuilt graphic card. The system uses various sensors such as IR Sensors, Sonar Sensors and a Camera module which helps the system to gather the required data. The system have used text to speech module to talk to the user. Python programs are the heart of the system. It is used to program the whole system which helps the raspberry pi to communicate with all the peripherals in the system. It then processes the collected data and converts it into information which is finally delivered to the end user.

The IR sensor is used to map the object 's shape and size while the sonar sensors get the data about the distance of the object at regular intervals and Object detection is done by using YOLO algorithm. Camera module is one of the important module as it plays an important role as it takes the pictures which is then processed using image processing technique to capture the image of the object. All the information is processed and converted into text which is then fed into a text to speech module. The text to speech module delivers this information to the end user in his/her ear through headphones.

The block diagram consists of two section which is hardware and software part :

Hardware: The main part of the hardware part is the raspberry pi computer the whole system is controlled by the raspberry pi computer. Raspberry pi has enough capacity to hold up the system, one advantage is that integrated graphics processing unit. The device has several sensors which help the system to gather the required data. The IR sensor used helps with motion detection and the sonar sensor calculates the distance of the object at regular intervals and the camera module plays a key role as it takes the picture which is processed using image processing technique to properly visualize the object.

Software: Python programming is the heart of our system. It basically runs the system. The program uses YOLO algorithm (object detection) which is installed on raspberry pi which detects the objects and text to speech module which converts text into listenable audio speech which is finally delivered to end use.

IV. RESULTS AND DISCUSSION

Detect the distance of the object(sonar sensor)

Sonar sensor is placed in the forward direction to get the distance of the object which is in front of the user. It uses sound-waves to detect the distance.

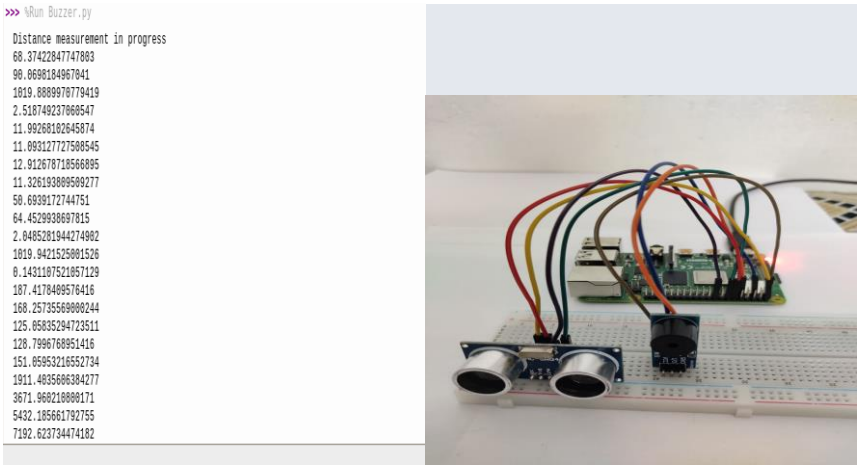

Figure 2 : The calculated distance through sonar sensor and circuit showing connection of Sonar and raspberry pi

Detect what is the object(YOLO algorithm)

Using YOLO algorithm written in python, the objects are detected through the pi camera connected to the raspberry pi. The real time object detection is fast and accurate. There is no latency while detecting real time objects.

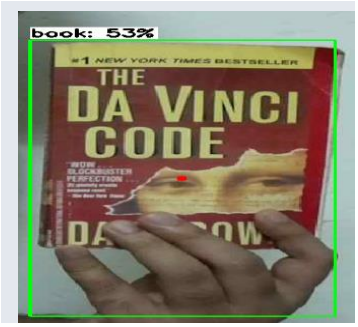

Figure 3: The detected object is Book

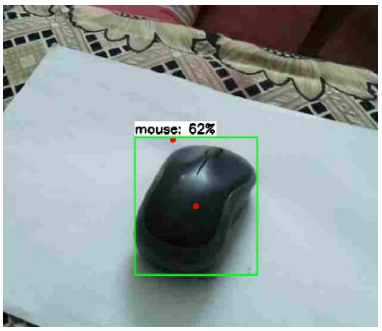

Figure 4: The detected object is mouse

V. CONCLUSION

Thus, our system for a visually imparied person is designed. The testing is yet to be conducted due to the pandemic. By this system we can change the way a blind person sees the world as it gives each and every information about the real world making. The main part of our system is about image processing. We know that there are various algorithms for image processing and we have tried quite a few of them and YOLO having the minimum delay in all of them we chose it to be our main algorithm.

VI. REFERENCES

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