Voice Based Navigation Sytem For Visually Impaired People Using Machine Learning Algorithm(YOLO)

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Abstract- *This paper describes the development of a navigation aid in order to assist blind and visually impaired people to navigate easily, safely and to detect any obstacles. The system is based on a microcontroller with speech output .It demonstrates a voice-assisted system that make use of machine learning algorithms such as object detection algorithm and Google API for voice assistance, to provide a navigation service for a visually impaired person .Here, we make use of ultra sonic sensors to detect whether object is in front and take distance of it .The goal is to guide the user through his path and giving perceive about his surroundings.*

Keywords- Voice Assistance, Ultrasonic sensors, Machine learning algorithm(YOLO).

I. INTRODUCTION

The world is ever changing. There has been a phenomenal growth in technology and economy in the past few decades. As a result, we are expected to adapt ourselves as per the changes implemented. These changes however may be comfortable to quite a large portion of the population. Nevertheless, the other set of population fail to adapt to these changes. Amongst them are the blind. Analysis of data from 188 countries suggests there are more than 200 million people with moderate to severe vision impairment. That figure is expected to rise to more than 550 million by 2050. Mobility is one of the main problems encountered by the blind in their daily life. Over time, blind and visually impaired people have used some methods and devices, such as the long white cane and guide dog, to aid in mobility and to increase safe and independent travel. Due to the development of modern technologies, many different types of devices[1] are now available to assist the blind to navigate.

With the advancements in Artificial Intelligence, we now have various algorithms that can perform tasks like identifying an object. This ability comes in handy, as this could practically act like an artificial eye to the blind. It could distinguish between static objects and dynamic objects and help the blind to walk around. A voice assistant is a software whose key role is to guide a voice command with appropriate replies to visually impaired person. With Google API such gTTS that that can generate appropriate voice to the person , we can assist the responses of a blind person by voices .Ultrasonic sensors are the ones which emits an ultrasonic wave while the other measures the echo. By differentiation of the input and output signals, the PIC16F876 computes the distance to the nearest obstacle. Then this information is transmitted as a Pulse Wide Modulation (PWM) signal to the receiver. The system has then an environment recognition and a clear path indicator functions.

II. METHODOLOGY

When ultrasonic sensor senses the object which is is in front of it. The person whose is facilitated with a camera module pointing in the direction that he walks. The purpose of camera is to capture a live feed of the path the person is walking on. From the live video feed, we capture images and we proceed through an object detection algorithm such yolo that determines what kinds of objects lie in the path the person walks. Commands the visually impaired person to navigate right or left based on the object in the frame and commanding in voice about what type of object. The requirements used in this system are

A. RASPBERRY PI 3

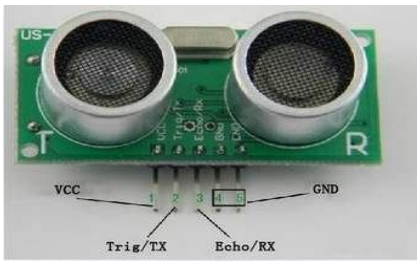
Raspberry Pi 3 Model B has 1 GB of RAM. The Raspberry Pi 3 (wireless) is equipped with 2.4 GHz WiFi 802.11n (150 Mbit/s) and Bluetooth 4.1 (24 Mbit/s) based on Broadcom BCM43438 FullMAC chip with no official support for Monitor mode but implemented through unofficial firmware patching and the Pi 3 also has a 10/100 Ethernet port. The Raspberry Pi is connected to the system via aRj45cable. Raspberry pi consists of different slots for performing different functions. Raspberry pi Foundation provided a Raspbian operating system for Raspberry Pi. Python and Scratch are the main programming language used, and also support many other languages.

B. ULTRASONIC SENSORS MODULE

The ultrasonic sensor module used as sensor for this application is the MSU10[16] from 'Lextronic'.

It has the following characteristics:

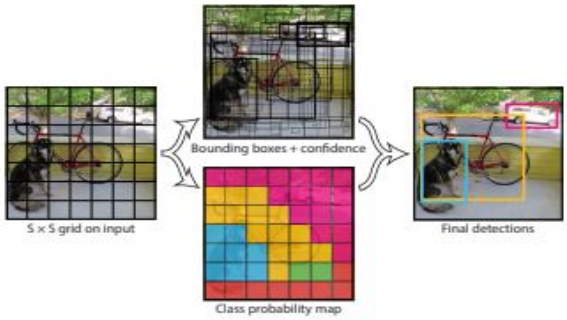
- Angle of detection: approximately 72°.
- Dimensions: 32 x 15 x 10 mm.



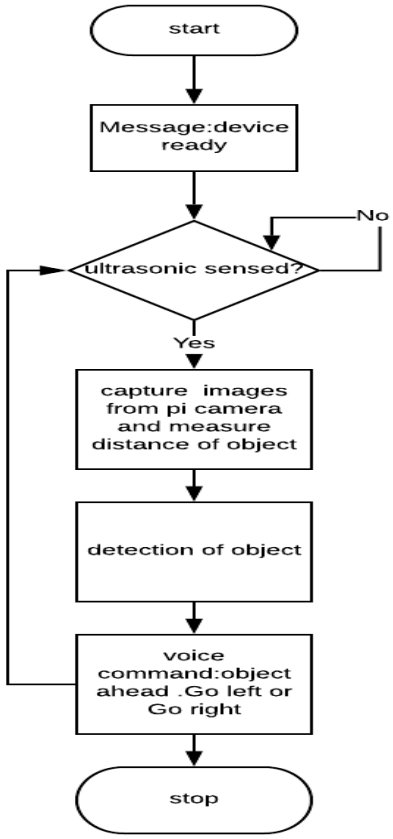
C. YOLO ALGORITHM

We unify the separate components of object detection into a single neural network. Our network uses features from the entire image to predict each bounding box. It also predicts all bounding boxes across all classes for an image simultaneously. This means our network reasons globally about the full image and all the objects in the image. The YOLO design enables end-to-end training and realtime speeds while maintaining high average precision

YOLO predicts multiple bounding boxes per grid cell. At training time we only want one bounding box predictor to be responsible for each object. We assign one predictor to be "responsible" for predicting an object based on which prediction has the highest current IOU with the ground truth. This leads to specialization between the bounding box predictors. Each predictor gets better at predicting certain sizes, aspect ratios, or classes of object, improving overall recall.



III. FLOWCHART



IV. RESULTS

When ultrasonic sensor senses the object ,we assist the visually impaired person to stop then , we capture the images frame by frame which is fed to the yolo algorithm which detects what kind of object is in front of the person .we command the person what is the object and how far it is from the person and provide the direction such as left or right for the blind person to navigate to the path he walks in.

V. CONCLUSION

In this paper we have come up with yolo algorithm for object detection which is probabilistic based approach and has pre trained object for about 9000objects with weight for fast detection and better accuracy in detection. Once the object is detected ,navigation commands are provided to the visually impaired person using Google API such gTTS

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