SMART ASSISTANCE FOR BLIND PEOPLE WITH AUDIO GUIDANCE BY USING FACE RECOGNITION METHODS

Sangram Madyapgol[1], Prof. Bharati Patil[2]
[1]PG Scholar, [2]Assistant Professor,
E&TC Engineering,PVPIT, Pune, India

Abstract

From the start of human history, many people are suffering from so many disabilities. Among those disabilities, blindness is very common and unendurable. According to the (WHO) World Health Organization worldwide 285million people are visually impaired, 39million people are blind and 246million people have low vision. Almost 90% people of the world's visually impaired people are living in developing countries. Technologies always try to make human life easier. So, the main purpose of this paper is to put an end to blindness by constructing a microcontroller based automated hardware that can confirm a blind people to detect obstacles or things or persons in front of them instantly and guide them about obstacle via audio . In proposed work model is trained with many objects and faces, and after that it is implemented by using Viola-Jones algorithm. Model contains microprocessor which receives data from camera and ultrasonic sensor and processes on it. And according to data guides blind person with audio via earphone. This model can also be used in self propelling vehicles, automatic robots in automated production factories etc.

I. INTRODUCTION

There are many methods to calculate the distance of obstacle. One of the methods is by using of ultrasonic sensor. Applications are mobility aid for blind person, self propelling vehicles and in robotics. Self propelling vehicles are automatic tools which are useful in industries which are dependent on automatic machines. The first part of the paper provides information of the ultrasonic sensors, based on the output waveform whose pulse width varies with distance measured with microprocessor unit. And also it will describe how to build an ultrasonic distance measurement system. In the second part of the paper describes how objects or faces are recognized by system. We are using Viola-Jones Algorithm for detection of objects. In object detection we are going to detect fixed shape objects and human faces. And guide blind people according to processed data.

II. METHODOLOGIES

In the first part of paper we are discussing about Obstacle Detection. To detect obstacles we are using Ultra Sonic Sensor HC-SR04. Ultrasonic ranging module HC-SR04 provides 2cm to 4m non-contact distance measurement. The HC-SR04 module includes ultrasonic receiver, transmitter and control circuit.

The basic principle of work:

A. Using I/O, trigger for at least 10μSec high level signal.

B. Module automatically sends eight 40kHz pulses and detect whether there is a echo signal back to receiver.

C. If the echo signal is back through high level, time of high output I/O duration is the time from sending ultrasonic signal to returning.

Obstacles Distance = (high level time×velocity of sound 340m/S) / 2

Wire connecting direct as following:

- 5V power supply,
- (Input) Trigger Pulse,
- (Output) Echo Pulse,
- Ground.

TABLE I. Electric Parameters of HC-SR04

Working Voltage	DC 5V
Working Current	15mA
Working Frequency	40Hz
Maximum Range	400cm
Minimum Range	2cm
Measuring Angle	15 degree
Trigger Input Signal	10µS TTL Pulse
Echo Output Signal	Input TTL level signal & the range in proportion.

Fig.1 HC-SR04 Module

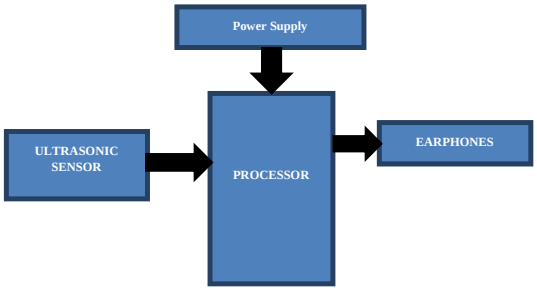


Fig.2 Block Diagram of Obstacle Detection Unit

Power Supply: Used to supply power.

Ultrasonic Sensor: Used for obstacle detection.

Processor: We are using Raspberry Pi processor for calculation of obstacles distance.

Earphones: Used for audio guidance.

If obstacle is detected by ultrasonic sensor, then its distance is calculated in processor by using formula:

Distance =

(High level time × velocity of sound) /2.

Calculated distance is used for guiding through audio.

III. FACE DETECTION and RECOGNITION

We are using Viola-Jones algorithm for face detection. And Eigenface approach for face recognition. By viola-Jones algorithm operating on 384 by 288 pixel images, faces are detected at 15 frames per second on a conventional 700 MHz Pentium III processor. There are mainly three methods used in Viola-Jones algorithm.

First one is Integral image, which allows for fast feature evaluation. It is new image presentation. We use a set of features, which are just like of Haar Basis functions.

The second part is a method for constructing a classifier by selecting a small number of important features using AdaBoost. Within any image sub window the total number of Harr-like features is very large, far larger than the number of pixels.

The third and important part is a method for combining successively more complex classifiers in a cascade structure which dramatically increases the speed of the detector by focusing on main regions of the image.

After detecting face, we use eigenface approach to recognize face. Before that while training, we save data of peoples and train our device with same sequence to give correct information. When face is recognized, we give information of people and guide blind person though earphones.

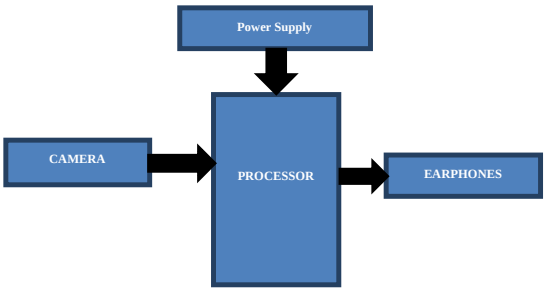


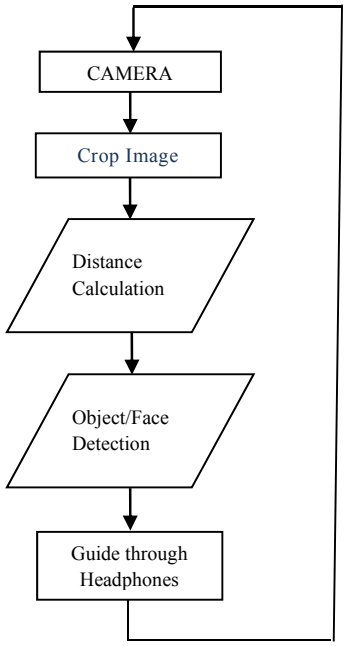
Fig.3 Block diagram of Object/face detection Unit

We are using same raspberry pi processor for which camera also integrated. Camera is used to capture image and processor processes on it. After processing on image related information is given through earphone.

IV. SOFTWARE REQUIREMENT

1. Gcc compiler
2. Open C Library

FLOW CHART:



V. HARDWARE REQUIREMENT

Distance of obstacle depends upon speed of ultrasonic and time required to traveling it. If the time required in traveling the pulse from sensor to object and return back to sensor can be measured than the measurement of distance can be done. This can be achieved by using an ultrasonic module which can give the time waveform on C.R.O. in terms of pulse width. The output pulse width will vary in proportional to the distance travel by the ultrasonic wave.

The sensor transmits an ultrasonic wave and returns an output pulse that is directly proportional to round trip delay. By measuring the pulse width of output wave, the distance to target can easily be calculated. The ultrasonic sensor produces Pulse width in the output. Ultrasonic sensor contains 4 pins these are Vcc, Trigger, OUT and GND. Vcc and GND are supply and ground pins. Trigger input receives 10μs trigger pulse. Microcontroller will make this pin HIGH then delay for about 10 μs and make pin LOW again. OUT pin gives the Output pulse width depending upon distance travel. After the trigger is given to microcontroller it measures pulse output on OUT pin. The output pulse duration is converted to distance measured and the temperature effect is also considered.

VI. CONCLUSION

This paper proposed new design and architecture for devices used to guide blind persons. The proposed combination of different units makes a real time system and guides blind person. We can also use this model in self propelling vehicles and automatic robots.

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