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Virtual Eye for Blind People

Ms.Harshali Kumbhar[1] , Ms.Nandini S. Mule[2] ,
Ms. Shamal Gaikwad[3], Mrs. Shweta Suryawanshi[4]

[1,2,3]Student ,[4] Asst. Prof ., E&TC Dept., DYPIEMR, Akurdi, Pune(India)

ABSTRACT

The beautiful gift given by god to human beings is vision. Vision allows human being to understand & survey safely in the world. But still now blind people struggle a lot to live life. The main objective of project is to make blind person fully independent in life. The main component in this system is ultrasonic sensor & camera. Ultrasonic sensors are used to sense the obstacle in front of the person. These sensors are fit in the two in shoes, one in cane & one in cap. For recognizing the difference between the wall & door one use camera is also used in the system. The main aim for our project is to provide the system for the blind people which give the information about environment scenario of static & dynamic object around them.

Keywords*: Ultrasonic sensors, USB camera, ARM Microcontroller, MAX 232, Headphone.*

I. INTRODUCTION

Vision allows human being to view the surrounding world. There are mainly two types of blindness i.e.; partially blindness & fully blindness. Partially blindness means lack of growth in optic nerve & fully blindness the person cannot see at all. There are mainly four levels of visual functions as follow:

1. Normal vision.
2. Moderate visual impairment.
3. Severe visual impairment.
4. Blindness

There are 285 million peoples are estimated to be visually impaired worldwide. There are 39 million blind & 246 have low vision. The main cause of blindness in India is as follows: cataract is (62.60%), refractive error is (19.70%), corneal blindness is (0.90%), glaucoma is (5.80%), surgical complications is (1.20%), posterior capsular pacification is (0.90%), posterior segment disorder is (4.70%) & others (4.90%).

According to the survey in last ten years the people which are aged above 50 years are suffering from this state. Thus the population of blind people is 0.47%.

So to help these visually impaired our proposed system is of ultrasonic sensor, camera as a input & headphone as output. Ultrasonic sensor & camera are the main building block of our project. Till date blind people are managing to travel with walking stick & obstacle detecting cane. The originally system utilizes an embedded vision of four simple ultrasonic sensor & measure the distance between obstacle & blind person. Camera is used to make a difference between door & wall. These information is proceed in ARM microcontroller. So there is no need of carrying cane or other tools. She/he can just wear the hat, a hand mini stick (size of pen) & foot shoes just like other. It is suitable for real time application.

II. LITERATURE SURVEY

Now days so many blind people struggling a lot to live. In order to help those people there are various technologies available. Literature analysis shows there are four technologies are used to help blind persons in order to overcome the difficulties in the previous methods and provide the cost effective and user friendly system.

2.1. Radio as tool for environment:

By using radio station we help the visually impaired person to find their information required for everyday. This system involves the synchronization of the different sound signals and reading of each signal bitwise. These signals store in database. Apply HMM algorithm and distribute the sound signal in one information database. Then speech recognition system is applies and each sound signal must create sound corresponding to it in database.

2. 2.GPS:

GPS is the Global Positioning System that uses longitudinal and latitudinal calculations for finding the position of the objects. Since it uses geospatial satellite signals for calculation of the positional difference from satellite, the accuracy is in the range of 100m to 300m.

2.3. RFID:

RFID is Radio Frequency Identification Device. It consist of unique identification code it may be symbol or number or text. RFID is wireless & it uses electromagnetic fields to transfer data for automatic identification. An RFID reader transmits an encoded radio signals to interrogate the tag and RFID tag receives the message and then responds with its identification and other information.

2.4. Mobile platform devices:

Here the wearable mobile smart devices are used as “visual eye” to assist blind person to navigate in surroundings. There are two main devices used in this system

1. This system has embedded wearable smart sensor that uses ultrasound sensor to detect object and send data to the other devices through Bluetooth.

2. Smartphone GPS unit in Smartphone to obtain the location information.

TABLE1: COMPARISON BETWEEN SENSORS

Name	IR sensor	Ultrasonic sensor
Discovery	Sir William Herschel	Lazzaro spallanzani
Frequency	430Thz to 300Ghz	42Khz
Range	15cm to 150cm	2cm to 400cm
Voltage	4.5 to 5.5V	2.5 to 5.5V
Wavelength	700nm to 1mm	8.6mm range

TABLE2:- COMPARISON BETWEEN MICROCONTROLLERS

Name	8051 microcontroller	ARM microcontroller
Voltage	4-6 v	3-3.6 v
Frequency	24MHZ	60 MHZ
RAM	256*8 bit	8-40KB
Pins	40 pins	64 pins
Timers/counter	Three 16 bit	Two 32 bit

III. BLOCK DIAGRAM

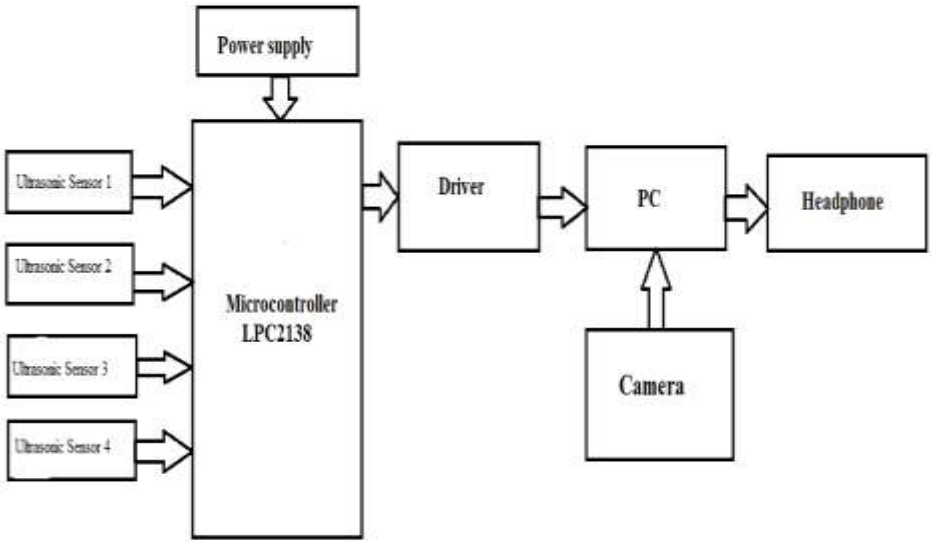

Figure1:- Block diagram of System

3.1 BLOCK DIAGRAM DESCRIPTION:

The block diagram of proposed Virtual eye for blind people shown in Figure1. The block diagram includes power supply, microcontroller LPC2138, four ultrasonic sensors, driver, PC, camera, headphone. The block diagram explains simple working of whole system developed. The power supply circuit provides the 3.3V regulated power supply for revitalizing the microcontroller module. The core of the system is a LPC2138 microcontroller. The ultrasonic sensors are used to measure the distance between person & obstacle. Driver circuit is used for communication of microcontroller with PC. Headphone is used as output to hear voice.

3.1.1 Power supply

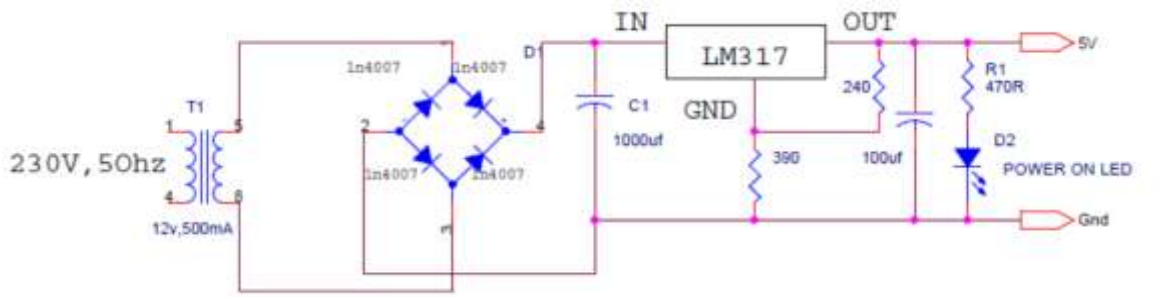

Figure 2: Circuit diagram for power supply

The circuit use standard power supply comprising of a step-down transformer of 12v and bridge rectifier which delivers pulsating dc and it is filtered by an electrolytic capacitor of about 1000uF. The filtered dc being unregulated IC LM317 is used to get 3.3v constant at its pin no 3 irrespective of input dc varying from 9to14v.

3.1.2 Ultrasonic Sensors

Figure 3:-Ultrasonic Sensor

In order to provide obstacle avoidance, Ultrasonic sensor is used. Ultrasonic ranging provides 2cm- 400cm measurement function, the value range accuracy is 3mm.it includes ultrasonic transmitters, receiver and control circuit. In Ultrasonic I/O trigger has at least 10us high level signals. Sensor automatically sends eight 40 KHz and detect pulse signal. If the signal back, through the high level, time of high output I/O duration is the time from sending ultrasonic to returning.

The ultrasonic sensor determines the distance to a reflective surface by emitting high-frequency sound waves and measuring the time takes for echo to be picked up by the detector. The ultrasonic sensor can determine the distance between two objects which are at 3 cm away closer than 3cm will result the sound waves echo back to the sensor before the detector ready to receive the signal. The ultrasonic sensor actually consists of two parts: an emitter, which is of 40 kHz sound wave; and a detector, which detects 40 kHz sound waves and sends an electrical signal to microcontroller. In order to determine the distance of an object, it is necessary to implement a timing loop in the microcontroller code to measure the length of the sound wave generated by emitter to traverse the distance to the object.

3.1.3 Serial Peripheral Interfaces (SPI):

Serial Peripheral Interface (SPI) is commonly used to send data between microcontrollers and small peripherals as shift registers, sensors. It uses separate clock and data lines, along with a select line to choose the device you wish to talk to.

3.1.4. Microcontroller

The LPC2138 microcontrollers are based on a 16/32-bit ARM7TDMI-S CPU with the real-time emulation and embedded trace support, that combine the microcontroller with 512 kb of embedded high-speed flash memory.

A 128-bit wide memory interface and unique accelerator architecture enable the 32-bit code execution at maximum clock rate. For critical code size applications, the alternative 16-bit Thumb mode reduces the code by 30 %more then with minimal performance penalty.

IV. METHODOLOGY

The developed controller for virtual eye has been carried out by following steps as depicted in the flow chart shown in Fig:

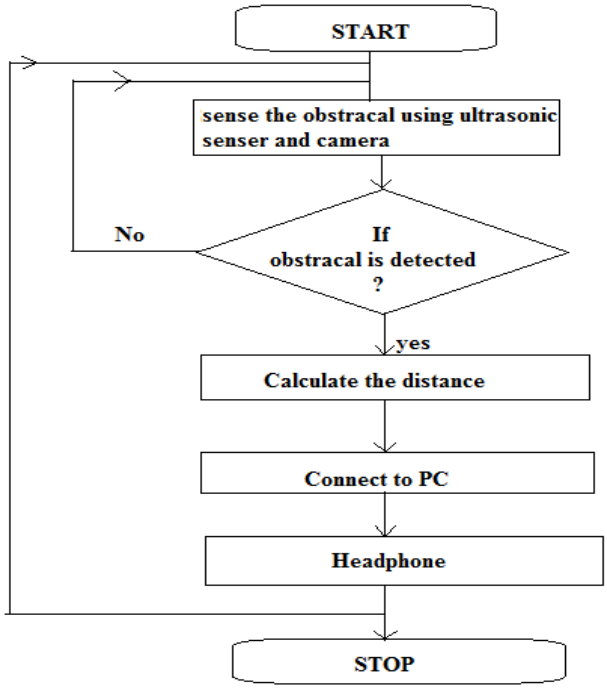

Figure 5:- Flowchart of System

V. ADVANTAGES

1. It requires low design time.
2. Low production cost.
3. Setting the destination is very easy.
4. It is dynamic system.
5. Less space.
6. Low power consumption.

VI. DISADVANTAGES

1. Sensor may get destroy.
2. It is difficult to understand complex direction.

3. It measures only the distance doesn't give any direction for the user.

VII. APPLICATIONS

1. This system can be used in the home, hospital and colleges
2. This system can be used for both known and unknown environments like airports, malls, public parks etc.

VIII. FUTURE SCOPE

1. FPGA unit can be added with a Bluetooth transceiver enabling device control in an automated area.
2. Nanotechnology can be used to minimize the dimensions of the module.
3. Medical monitoring system (ECG, BP, Sugar level) can be added to care the visually impaired patient.
4. The travelling route of VI person can be tracked for monitoring him.
5. System can be designed to interact with the ATM machines in voice for convenience

VIIII. CONCLUSION

A simple, configurable and easy to handle electronic guidance system is design to provide constructive assistant and support for blind and visually impaired persons. The system is designed, implemented, tested, and verified. The real-time results of the system are encouraging; it revealed an accuracy of 93% in detecting distances.

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