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Blind Man Stick Using Programmable Interrupt Controller (PIC)

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Abstract: It is well known that people suffering from visual impairments face many difficulties in travelling independently. Due to this, they rely on some form of external aids, which include a variety of tools and techniques like a stick. Such tools are called Electronic Travel Aids (ETA). Sometimes even with the use of this stick, the safety of the blind person is not guaranteed. The stick may not always detect all the obstacles in the path.

The objective of this project is to build a blind man stick that can detect obstacles, potholes and thus help the blind person travel independently. The system is constructed using ultrasonic sensors, a vibrator, buzzer and a power supply. The software used in this system includes Embedded 'C', Pickit 2 Programmer, MPLAB.

I. INTRODUCTION

Visually impaired people require an efficient method to move around independently. Recently, many techniques have been developed to help the blind move freely in a dynamic environment as well [1]. Blindness is a very common disability among the peoples throughout the world. According to the World Health Organization (WHO) 285 million people are visually impaired worldwide, 39 million are blind and 246 have low vision. About 90% of the world's visually impaired live in developing countries. For the indigents blindness is a curse. They need help to walk outside and all other daily essential works. So the paper glows a system that tries to remove the curse of blindness and make them self- dependent to do their daily chores. It is a walking stick, normally used by the blinds. But it is fully automated, easy to maintain, cheap and it is very comfortable to use. The power consumption is low and can be operated easily. Above all the stick is very economic over the conventional one. The walking stick mentioned above is a stick that consists of a circuit board that contains a PIC micro controller, different sensors, and buzzer [3].

The ordinary stick is mostly preferred by the blind people for walking. But the limitation to the ordinary stick is that the information obtained by the blind user is only by touching the objects by the tip of the stick, which is not completely reliable. Through this proposed paper we offer to give a solution which overcomes the limitations of the ordinary white cane. The ultrasonic blind walking stick is fully automated, comfortable to use and cheap. In other words, it is quite economic over the conventional method [4].

The ultrasonic sensors, water sensor, buzzer, and RF transmitter/Receiver are used to record information about the presence of obstacles on the road.

Ultrasonic sensor have the capacity to detect any obstacle within the distance range of 2cm-450cm. Therefore whenever there is an obstacle in this range it will alert the user. Water sensor is used to detect if there is water in path of the user. Most blind guidance systems use ultrasound because of its immunity to the environmental noise. With the rapid advances of modern technology both in hardware and software it has become easier to provide intelligent navigation system to the visually impaired [7].

II. METHODOLOGY

This section deals with the theory of some of the components used as well as the design and implementation of an intelligent walking stick for the blind.

The ultrasonic sensor transmitter generates signals and transmits them in a particular direction which will then be reflected back when they are approaching any obstacle(s), then the ultrasonic sensor receiver receives it and sends it to the micro controller which will trigger/switch ON the Buzzer. Our proposed system is made up of the Ultrasonic sensor was interfaced to the micro controller, codes were written with the Arduino sketch and the physical sensor was connected to the micro controller [7].

To determine the distance of an object , calculate the distance between sending the signal and receiving back the signal.

Distance=speed*time

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The speed of the signal travelling through air is 341m/s. The time is calculated between the sending and receiving back the signal. Since the distance travel by the signal is double, it is divided by two i.e.,

Distance=Distance/2

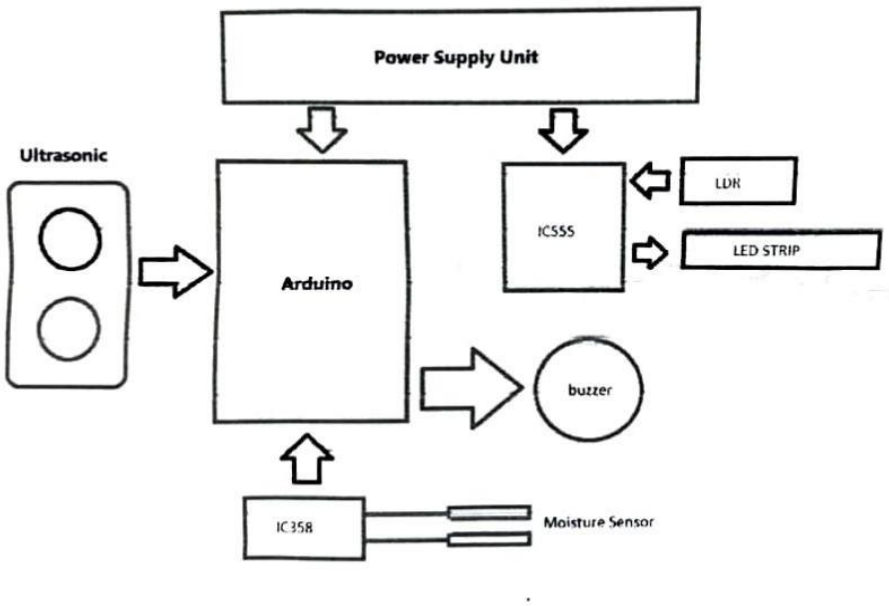
The command condition is as follows:

(a) If the distance between the objects and the person is 30 inch, it will send the command as the obstacle is nearer to the person.
(b) If the object is about 60-90 inch, it will send the command as the obstacle is just closer and reaching the person.
(c) If the object is about 90-120 inch, it will send the command as the object is far away from the person [5] .

III. LITERATURE REVIEW

(i) Working and block diagram:

The main components of the system are the ultrasonic sensors used. The ultrasonic sensor is attached to the front of the stick to detect obstacles ahead of the person. While the user moves the stick forward , the ultrasonic sensor will scan the area in its range (3cm - 4m) and an obstacle (if any) is detected, the ultrasonic sensors send out waves and depending on the time taken for the waves to return it determines if the person is too close to the object or not. This output is then given as input to the micro controller. The on-chip ADC converts this input analog signal to a digital signal which can be read by the micro controller. The digital signal given to the micro controller is used to calculate the distance of the obstacle detected in the path. If the distance is below the given threshold the micro controller will send a signal to the vibrator and buzzer which will warn the blind person that he/she is too close to an obstacle and need to change the direction of their path. The entire controlling unit is fixed to the hand stick. Figure 1 shows the block diagram of the proposed system [1]



(ii) Ultrasonic Sensor:

The 28015 ultrasonic also known as The PING sensor is a 3 pin sensor that can detect obstacles in the range of 2cm-400cm (4 meters). It is very easy to connect to the micro controller using only 1 I/O pin.
Features [1].

- Supply Voltage – 5 V (DC)
- Supply Current – 30 mA type; 35 mA max
- Range – 2 cm to 4 m
- Input Trigger – positive TTL pulse, 2 uS min, 5 µs type.
- Echo Pulse – positive TTL pulse, 115 uS to 18.5 ms

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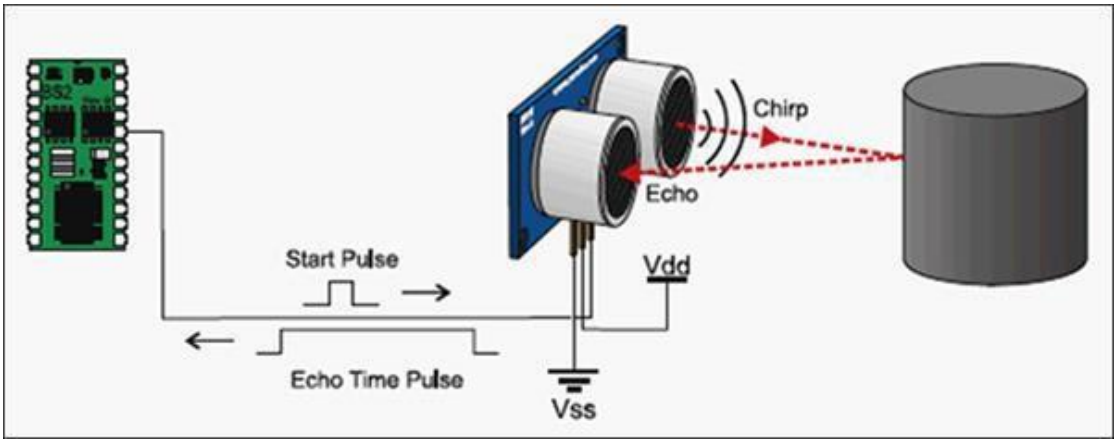
- Echo Hold-off – 750 µs from fall of Trigger pulse
- Burst Frequency – 40 kHz for 200 µs
- Burst Indicator LED shows sensor activity
- Size – 22 mm H x 46 mm W x 16 mm D (0.84 in x 1.8 in x 0.6 in) Pin Definitions:

1) VCC- 5V (DC)
2) GND
3) SIG- Signal I/O [1] .



IV. RESULTS

1. The obstacle is detected by the stick and user is notified by a buzzing alarm.
2. Level sensor detects the water and notifies the user with a different buzzing sound. [4].

V. CONCLUSION

The Blind Walking Stick has been finally made into prototype which can be used to guide the blind . Its aims to solve the problems faced by the blind people in their daily life. The system also takes the measure to ensure their safety . This project will operate to help all the blind people in the world to make them easier to walk everywhere they want. It was done to help the blind to move in front very well. It is used to help the people with disabilities that are blind to facilitate the movement and increase safety [5] .

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