

Ultrasonic Spectacles & Waist- Belt for Visually Impaired & Blind Person

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Abstract: - This paper presents an electronic navigation system for visually impaired and blind people. This system understands obstacles around it and in front, left and right direction using a network of ultrasonic sensors. It effectively calculates distance of the detected object from the subject and prepares navigation path accordingly avoiding obstacles. It uses speech feedback to aware the subject about the detected obstacle and its distance. This proposed system uses AT89S52/LPC2148 microcontroller based embedded system to process real time data collected using ultrasonic sensor network. Based on direction and distance of detected obstacle, relevant pre-recorded speech message stored in Voice and play back circuit. Such speech messages are conveyed to the subject using speaker on voice and playback circuit.

Keywords: - Blind people, Ultrasonic sensors, AT89S52 microcontroller, Detected obstacle, Speech message, Voice playback & circuit.

I. INTRODUCTION

In existing method IR sensor is attached to stick of blind person is used to detect obstacles. When sensor detect obstacle it just give buzzer sound as indication, but this buzzer sound does not indicate person exact direction of obstacle.

The main aim of the project is to design a voice based alerting system for the blind people based on ultrasonic distance sensor for obstacle detection and voice circuit for voice based announcements. The advantage of this device is voice based announcement for easy navigation that is the user gets the voice which pronounces the directions he needs to move to reach his destination.

Ultrasonic Sensor senses the obstacles in its path by continuously transmitting the ultrasonic waves. If any obstacle comes in its vicinity then the ultrasonic waves get reflected back to the system. The ultrasonic receiver senses these ultrasonic waves and this information are passed to the Microcontroller. The microcontroller gives alerts through voice message.

When the blind person wears this ultrasonic waist-belt at stomach or at head, which consist of an ultrasonic distance sensor, Ultrasonic distance sensor, which is capable of detecting obstacles in its path of a blind person, senses the obstacles. This information is passed to the microcontroller which then alerts the user through voice circuit in case of any obstacles in that particular direction, which helps the user to avoid obstacles in its way.

The controlling device of the whole system is a Microcontroller. The user gets alerts through ultrasonic distance sensor and voices using voice circuit. The ultrasonic distance sensor and voice circuit interfaced to Microcontroller. This system is very helpful for blind people.

II. HARDWARE & SOFTWARE

2.1 HARDWARE

2.1.1 8051 MICROCONTROLLER AT89S52

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard 80C51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications. The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM,

timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM contents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.

2.1.2 VOICE PLAYBACK CIRCUIT-APR9600

The APR9600 device offers true single-chip voice recording, non-volatile storage, and playback capability for 40 to 60 seconds. The device supports both random and sequential access of multiple messages. Sample rates are user-selectable, allowing designers to customize their design for unique quality and storage time needs. Integrated output amplifier, microphone amplifier, and AGC circuits greatly simplify system design. The device is ideal for use in portable voice recorders, toys, and many other consumer and industrial applications. APLUS integrated achieves these high levels of storage capability by using its proprietary analog/multilevel storage technology implemented in an advanced Flash non-volatile memory process, where each memory cell can store 256 voltage levels. This technology enables the APR9600 device to reproduce voice signals in their natural form. It eliminates the need for encoding and compression, which often introduce distortion.

2.1.3 VOLTAGE REGULATOR-7805

This series of fixed-voltage integrated-circuit voltage regulators is designed for a wide range of applications. These applications include on-card regulation for elimination of noise and distribution problems associated with single-point regulation. Each of these regulators can deliver up to 1.5 A of output current. The internal current-limiting and thermal-shutdown features of these regulators essentially make them immune to overload. In addition to use as fixed-voltage regulators, these devices can be used with external components to obtain adjustable output voltages and currents, and also can be used as the power-pass element in precision regulators.

2.1.4 ULTRASONIC SENSORS-(HC-SR04)

Ultrasonic sensors (also known as transceivers when they both send and receive, but more generally called transducers) work on a principle similar to radar or sonar which evaluates attributes of a target by interpreting the echoes from radio or sound waves respectively. Ultrasonic sensors generate high frequency sound waves and evaluate the echo which is received back by the sensor. Sensors calculate the time interval between sending the signal and receiving the echo to determine the distance to an object.

2.2 SOFTWARE

2.2.1 EMBEDDED 'C'

An embedded system is a software system that is completely encapsulated by hardware that it controls, i.e., an embedded system is a combination of computer hardware and software. A real time embedded system is one whose logical correctness is based on both the correctness of the outputs and also timeliness, i.e., response time constraints. A system has set of one or more inputs and one or more outputs. The time between the presentation of a set of inputs to a software system and the appearance of the all the associated outputs is called the response time of the software system.

2.2.2 KEIL SOFTWARE

Keil development tools for the 8051 Microcontroller Architecture support every level of software developer from the professional applications engineer to the student just learning about embedded software development.

The Keil 8051 Development Tools are designed to solve the complex problems facing embedded software developers. When starting a new project, simply select the microcontroller you use from the Device Database and the μ Vision IDE sets all compiler, assembler, linker, and memory options for you. Numerous example programs are included to help you get started with the most popular embedded 8051 devices.

III. DISTANCE CALCULATION

Ultrasonic distance sensors consist of 3 major parts: A transmitter, a receiver and a timer.

To measure a distance the timer triggers the transmitter which emits a series of pulses, and then the timer waits until the receiver detects the reflection of the pulses and stops the timer.

The time measured is then divided by 2 and multiplied with the speed of sound. The result is the distance between the sensor and the object in front of it. The transmitter sends out a stream of pulses on a carrier frequency.

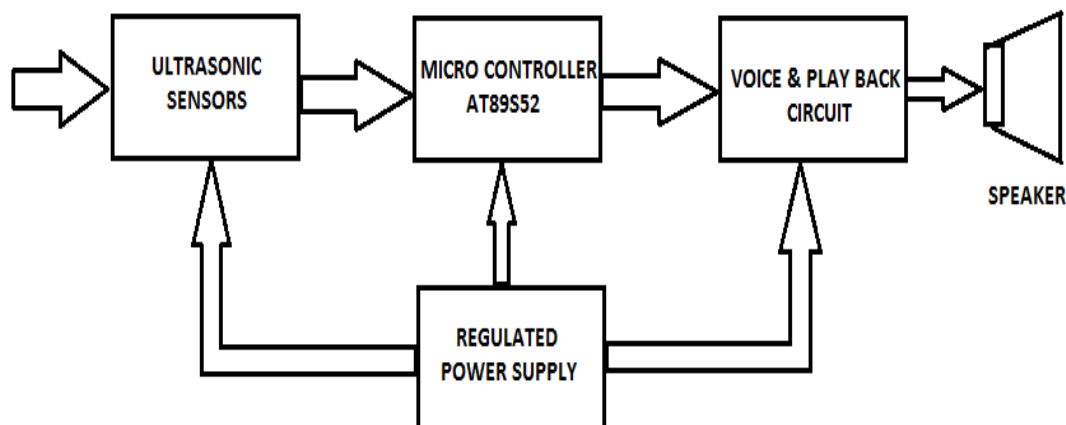
The receiver triggers when it receives a signal with that particular frequency. If more than one ultrasonic sensor with the same carrier frequency is used, they can detect each other signals.

The formula for calculating distance:

$$\text{DISTANCE} = 343 \text{m/s} * \frac{\text{Elapsed Time}}{2}$$

343 m/s is the speed of sound,
And we need to divide the time by 2
Because the sound travel out and back.

IV. BLOCK DIAGRAM



V. DESCRIPTION

This system uses two ultrasonic sensors to find out the obstacles in front of blind people. The ultrasonic sensor we use here is HC-SR04 which contains 4-pins. To first pin power supply is given, second pin is connected to P2.1 pin of controller to trigger ultrasonic rays, fourth pin is connected to ground and third is connected to P2.2 pin of controller which receives echo's when any obstacle is detected by ultrasonic rays the rays gets reflected and reflected rays is received by the this third pin and gives indication to controller obstacle is present in that direction. Once it detects the obstacle the controller will give voice alert information through voice and play back circuit. Here we are using APR9600 RE- Recording Voice IC for giving voice alert message to the blind people. Thus we can easily identify any obstacle present around the blind people.

VI. FUTURE SCOPE

The number of applications for this device is numerous which are as follows:

1. It works as a navigation device for the blind people. This project is mainly focused to provide a good navigation system for the visually impaired.
2. This system can be used to navigate by everyone not only visually impaired under certain circumstances, like foggy mornings with low visibility. Some winter mornings are foggy. Where the visibility is very low, then this system can be used.
3. This system can also be used by patients suffering with various eye ailments like cataract, xerophthalmia, post eye operative situations and others.
4. This system can be modified into a more sophisticated version of itself by using high intensity ultrasonic waves to be used as a navigation system for geological explorations.

Hence this device has a good future scope. By improvising it depending on our requirement like **effective sensors and controllers example PIC, ARM**, we can use it for various purposes as mentioned above.

VII. CONCLUSION

“Ultrasonic Spectacles and Waist-belt for Visually Impaired and Blind people” is mainly intended to design a voice based alerting system for the blind people based ultrasonic distance sensor for obstacle detection and voice circuit for voice based announcements. The advantage of this device is voice based announcement for easy navigation i.e. the user gets the voice which pronounces the directions he needs to move to reach his destination.

This can be extended by using ranger finders which can detect the obstacle presence from a longer distance and also helps in increasing the efficiency of the system.

Some advantages of the projects are:-

1. Guides blind people.
2. Alerts through voice based messages system.
3. Obstacle detection using ultrasonic distance finder sensor
4. Efficient low cost design.
5. Low power consumption.

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