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A Mobile Robostick for Visually Impaired People

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Abstract:- God gave sense of perception to the human being is an important aspect of our life. But there are some unfortunate people have less ability of vision. The visually impaired have to face many challenges in their daily life. The problem gets bad when they visit to an unknown location. Only few of the navigation systems available for vision impaired people can provide active navigation through speech output. None of these systems work perfectly for both indoor and outdoor applications. The proposed system is very useful in blind people to indicate the alarm for avoiding accident. In system microcontroller is used to as oscillator to generate the frequency signal. Then ultrasonic transmitter gets generated frequency signal. Ultrasonic transmitter and receiver are fixed in front of the robostick. The sender transmits the ray towards receiver. The transmitting pulse has been changed according to the distance. From this, the microcontroller monitors the distance between the object and the stick and gives navigation through headphone jack to blind person.

1. INTRODUCTION

The vision impaired has to face more difficulties in their life. The problem gets worse when they travel to an unknown placed. Very few of the navigation devices are there for visually impaired people which can provide dynamic navigation through speech output. None of these systems work perfectly for both indoor and outdoor applications. The aim of the overall system is to provide low cost and efficient navigation aid for the blind which gives the sense of artificial perception by providing data about the environmental scenario of static and dynamic object around them. Ultrasonic sensor are used to calculate distance of obstacle around the blind person to guide the user towards the output is in the form of voice which the blind person can hear .The hardware consist of Ultrasonic sensor ,Microcontroller 8051,Navigation system ,6V battery ,Stick[4].

2 .DESIGN DETAILS OF THE ROBOSTICK

The major components used and the functionality of each stage of operation of the electronic walking aid are explained in the this sections:

2.1 The major components:

1. L293D IC:

The L293D are quadruple high-current half-H drivers. The L293D is designed to provide bidirectional current up to 600-mA at voltages range from 4.5 V to 36 V. L293D is designed to drive inductive loads such as dc and bipolar stepping motors, relays, solenoids, as well as other high-current/high-voltage loads in positive-supply applications[6].

2. 89V51RD2 Microcontroller:

The P89V51RD2 is an 8051/8052-pin-compatible microcontroller by NXP (ex-Philips), with 64+8kB FLASH code memory, 768B internal Random Access Memory(RAM) , 6-clock mode, and a couple of extended peripherals, such as the PCA unit, watchdog counter and Serial Peripheral

interface(SPI) .The most remarkable feature is, however, that it's FLASH can be in-situ programmed through UART; and also its self programmability (in-application programmability, IAP)[2].

3. Voltage Regulator:

A voltage regulator usually have three legs, converts varying input voltage and produces a fixed regulated output voltage. They are accessible in a variety of outputs. The most familiar part numbers start with 78 or 79 and finish with two digits as the output voltage. The number 78 shows a positive voltage whereas 79 negative one. The 78XX series of voltage regulators is for the positive input. Whereas the 79XX series is designed for negative input. For example, 5V DC regulator names are: LM7805 or MC7805 and -5V DC regulator names are: LM7905 or MC7905 and 6V DC regulator names are: LM7806 or MC7806[1].

4 .Speaker:

Speaker is the output device that gives the required voice instruction when an object is encountered in the navigation path of the user of the Robostick or when the help is required by the user of the stick. There are two types of speaker on this Robostick; the earphone that is continuously worn by the user, which gives the output when an object is encountered in the path of the user and the loudspeaker which gives the voice message as an output but mainly used to give a voice output in emergency such as when the Robostick falls down.

5. Voice Module:

The APR9600 device offers true single-chip voice recording, non-volatile storage, and playback capability of about 40 to 60 seconds .The random and sequential access of multiple messages are supported by the device .As sample rates are user selectable therefore ,they allows designer to build their design for particular unique quality and storage time needs. AGC circuits, microphone amplifier, Integrated output amplifier effectively simplify system design. The device is ideal for use in toys, portable voice recorders, and many other industrial and consumer applications. By using its proprietary analog/multilevel storage technology APLUS integrated achieves these high levels of storage capability. Due to this technology APR9600 enables the device to regenerate voice signals in their natural form. It abolishes the encoding and compression need, which often introduce distortion. Figure 1 shows APR9600 voice module [7].

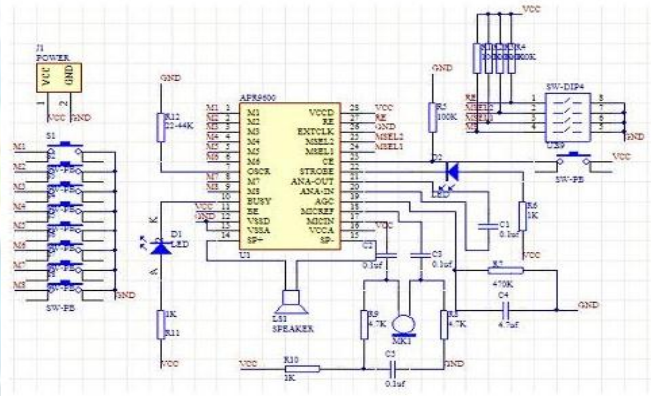

Fig 1: Voice Module

3. SYSTEM ARCHITECTURE OF MOBILE ROBOSTICK

The walking aid schematic and circuit diagrams are illustrated in fig. 2. The design consists of three levels which are control level, power level, and output level. The relationship between the different components and levels of the model are shown in the block diagram. To reduce the voltage level to 5V which is the voltage required to power the ultrasonic transmitter and receiver, microcontroller, voice output amplifier, light detection circuit and the voice recording chip a 12V battery is connected to a voltage regulator .When power supply is ON ,microcontroller produces 10ms pulse which is sends to the sensor ,after receiving the pulse sensor detect object. In case there is an object along the pathway of the Robostick, and this activates one of the input pin of the microcontroller. Once this occurred, the microcontroller will accordingly activate the voice recording microchip which then gives the relevant output via the speaker[1].

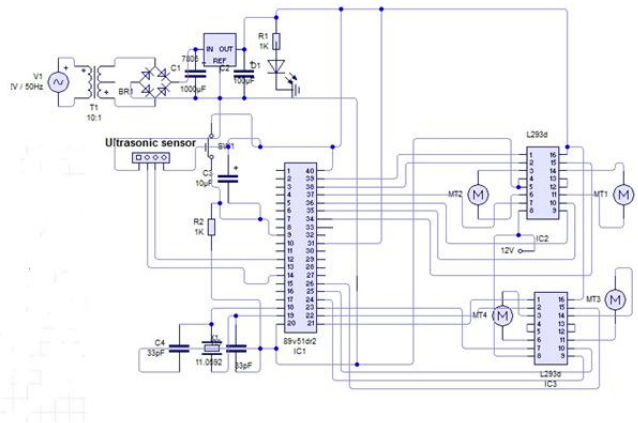

Fig 2 .System architecture of Mobile Robostick

3.1. Levels of walking stick:

The walking stick design, as shown in the complete circuit diagram in fig. 5, consists of three functional stages, Function of each of these stages is explained below**:**

1. Power Level

The power level, as shown in fig. 2, supplies 5V to power all the components in other stages. It have a 9V battery which is attached to a voltage regulator which regulates the voltage to 5V which is the required voltage to power the microcontroller, ultrasonic sensors, light detection circuit, ISD 2590 voice recording module and LM386 amplifier[7].

2. Control Level:

The control level involves the connection of the ultrasonic transmitters and receivers, microcontroller ,light detection circuit and 8 MHz crystal oscillator. The ultrasonic sensors and receivers operate at an ultrasonic frequency ; this frequency is sent out by the pin 17 of the PIC 16F877 microcontroller. Whenever object are find out within the ultrasonic detectors sensing range, the signal released is reflected by the object back to the ultrasonic receiver which then transfer a signal to any of pin .The crystal oscillator serves as the system clock which is a resonator[7].

3. Output level:

The output level consist of interfacing the 89V51RD2 microcontroller with the voice recording module ARP9600 and attaching it to the speaker to give a voice output whenever an object is detected by any of the ultrasonic sensors. The microcontroller produces a 10ms signal at the input stage which is sent out by the transmitting sensor, the produced signal is reflected to the receiver of the sensor when the ultrasonic wave hits an object within the sensor range. The signal received by the receiver is sent to the 89V51RD2 microcontroller pins .The state of each pins explains which of the recorded voice signals on ARP9600 that will be played. The outputs of the ARP9600 recording module are connected to an amplifier. To make the received audio signal clearer and more audible enough for reproduction via the speakers a Amplifier is used[5].

4. CONCLUSION

The implementation of a Robostick for blind people using ultrasonic sensors with voice output is of great benefit t to blind people when it comes to independent mobility. The prototype of the vision impaired aid is able to detect object which is present in front of user. And, it is therefore capable of guiding a vision impaired person to navigating his environment.

5. FUTURE SCOPE

It works better but it can further enhanced by detecting obstacles from large distance by increasing the range of ultrasonic sensor. However, the Robostick cannot determine the distance of the object .Hence this can be an improvement on this Robostick.

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