ELECTRONIC GUIDE CANE WITH ULTRASONIC EYES FOR VISUALLY IMPAIRED

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ABSTRACT

The navigation assistance systems for blind people are equipped with the conventional long guide cane with a bell, talking signs, etc. They are peoviding the assistance for blind people but failing in join the blind people in traffic and busy roads. In this project, we are implementing a new technique for assistance of blind people by using the ultrasonic sensors and a GSM modem. The navigation system is intended to be useful for the blind people while they are walking alone in traffic or somehere else. The system will provide the obstacles avoidance feature and vehicle dash avoidance to the blind people. The input from the ultrasonic sensors will be analysed by the microcontroller integrated in it and according to the output obtained, the microcontroller controls the output modules like vibrating motor and voice playback module. The voice playback and vibration motors will provide instant alerting for blind people in case of any obstacles detected in their path. In addition ,we have a GSM modem connected to the microcontroller. It gives the emergency rescue by sending a message to the corresponding care takers of that person through GSM modem.

Keywords: Ultrasonic Sensors, Vibrating Motors, Voice Playback

I. INTRODUCTION

In this busy and economic world, people are running towards their destinations to prove their significance in this commercial society. The disability shouldn't be a limit for any person to reach their goals and to fulfil their dreams. So, the disabled persons also competing the others with more confidence. But the problem of the blind people is more difficult than other disabilities. The main aim of our peoject is to implement an easy navigation system for blind people. By overcoming the drawbacks with the existed technologies like guide cane and talking signs that they are only giving a support while they are walking, but not avoiding the accidents due to some vehicles and man holes. The existed systems are also failed in information sending in case of emergencies. The blind people navigation. With the present proposed system, the blind people assistance will be more enhanced with the ultrasonic sensors. It provides a safe assistance to the blind people and let them proceed with their daily activities. The system consists of two ultrasonic sensor modules, a GSM modem, voice playback module and a vibration motor. As of now we are implementing a prototype of the blind assistance system, we are implementing a kit which shows the functionality of the system. In real time, we can design entire system in a blind stick or guide cane type model. The design will have two ultrasonic sensors placed in front and back directions of the system. It represents that the two ultrasonic sensors provide two way obstacle sensing for the blind people. Now a days the mobile communication is expanding it's significance all over the world. And the human lives becomes hang up with mobile phones wherever they travel. The mobile phone becomes a major aspect in our daily life to get connected with the people and all world. In our system we are using a GSM modem to provide the information exchange from the blind person to the care taker. Eventhough there is a GSM modem connected in our system, it is no more reliable to send the messages all the time in every dangerous

situation. We should provide an instant rescue solution in our assistance system. For that, we are connecting a vibration motor and a voice playback module. The main aim of the project is to provide an efficient solution for blind people assistance by utilizing the modern technology and by avoiding the drawbacks of the existed guide canes and all. The ultrasonic sensors will monitor the objects infront of them. The sensor placed in front direction to the system will detects if any obstacles are present infront of the blind person path. Another sensor placed in back direction of the system will measure the distance from the objects to the blind person. The voice module will play the corresponding voice for intimating the blind person about the danger happening. The vibration motor is useful in case of person is in traffic and if the voice output is not audible in busy areas. In an addition, there is a GSM module connected to the system, for providing the information exchanging from the blind people. Due to using GSM technology, the blind person will be connected with all over the world because of the increased network coverage and reduced charges in mobile communications. In fact, the other wireless technologies like Bluetooth, Zigbee, RF and Wifi, Ethernet, etc. may be used for information exchange. But the problem with all those technologies is communication range is less compared to GSM, except the etherner will get connected all over the world, eventough the GSM networks will be available in a small village also but not internet connection. Moreover the GSM technology is less expensive than internet.

II. LITERATURE REVIEW

The system implementation has done after studying on some previous technologies of blind people assistace. As referred in A Navigation tool for Blind People Maounir Bousbia-Salah, Mohamed Fezari, University of Annaba, the system described is consisting of ultrasonic sensors, and vibrating motors for blind people navigation assistance. In that system, there is ultrasonic sensors one is placed in walking stick and one is placed on blind person shoulder. This system is lagged at not having any information channel. The proposed system design in a walking stick is inspired from the A wireless ranging system as an embedded sensor module for the long cane Gao, R. ; Dept. of Mech. & Ind. Eng., Massachusetts Univ., Amherst, MA, USA ; Xiaofeng Cai. In this system there is a blind stick attached with ultra sound sensors which provide a radar working principle. The walking stick is also equipped with a talking sign system. The study about the vibrating motor and also the about providing an information channel for the navigation system is referred from various publishings in the international journal, finally after studying research on communication technologies, we are decided to use the GSM in our project. The vibrating motor is the device which is used to give some vibration which is identified by the blind person easily. The study about ultrasonic sensor in more detailed way is done from An electronic travel aid for navigation of visually impaired persons Kumar, A. ; Checktronix India Pvt. Ltd., Chennai, India ; Patra, R. ; Manjunatha, M. ; Mukhopadhyay,J. There in that system used no.of ultrasonic sensors for measuring the distance from each every side of the blind person. The system is also contained a wireless transmittion technology with RF communication which is not even an efficient technology in the range of communication aspect and also for the blind prople requirement.

III. SYSTEM ARCHITECTURE

The system architecture describes the primary modules in our system. There are mainly Ultrasonc sensors, GSM modem, Vibration motor and voice module are presented in our system.

The following figure shows the block diagram of out proposed system. It consists of two ultrasonic modules for obstacle detection and object range detection respectively. The LPC2148 microcontroller is used as the processing section for the entire system. The brief description about the hardware modules is given below.

The LPC2148 microcontroller is a 32 bit controller which is available in different IC pakages in market. As per our requirement, we preferred 64 pin quad package IC of LPC2148. LPC2148 consisting of ARM7 core as processor in it. If we queried like why we are choosing the LC2148 microcontroller among various microcontrollers by different manufacturers? The criteria behind choosing the LPC2148 having some considerable causes such as less power consumption, many onchip features. The LPC2148 works with only 3.3v power supply as of many microcontrollers works with 5v supply. Moreover the LPC2148 has many obchip features like SSP, UART, RTC, etc.
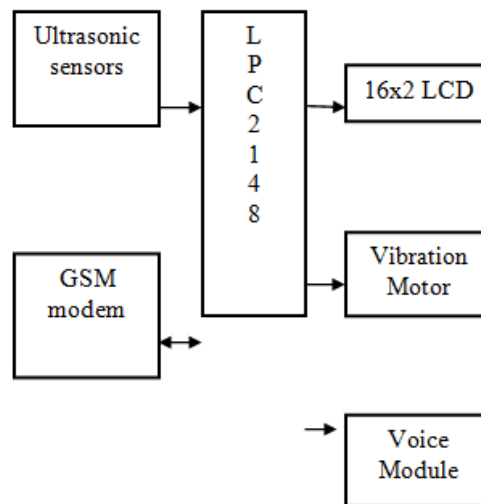
Fig 1: Block Diagram

The Ultrasonic sensors used in our project are two types, one is for distance measurement and another one is for obstacle detection.

Fig 2: Ultrasonic Sensor

The ultrasonic sensor used for distance measurement is HCSR04, it works on the principle of RADAR. When the trigger pulse id generated from the sensor, it continuously emits the EM waves from it and when the waves hit the target, it generates the echo waves back to the sensor. The microcontroller is necessary to process the echo waves and calculate the distance based on the time taken by echo signals to reach back to the sensor. The sensor used for the obstacle detection is PING 28015. It is also works similar to the HCSR04 but the difference is we need not to calculate the time of the echo waves but only to monitor if any echo waves are generated from the obstacle. As described above, the two ultrasonic sensors works for avoding the dangers from the obstacles.

The GSM modem used for information exchange in case of emergencies. The GSM modem used in our system is SIM900 type. It is an industrial version of a GSM mobile phone with all features like calling, messaging, GPRS, etc. The modem can be interfaced to the LPC2148 by using RS232 protocol through onchip UART of LPC2148. The mobile operations like sending SMS and receiving SMS can be done programming the AT (attention) commands from the microcontroller. The baud rate of the GSM modem is 9600bps.

It supports the standard SIM card as it is having a SIM slot in it. It requires a 12v 1Amp power supply to operate.

Fig 3: SIM 900 GSM Modem

The sigle chip voice recording and playback module is used in our system for alerting the blind person about the obstacles. The voice playback module consists of a 16 bit digital voice processor IC APR33A3 which is having the 8 voice channels with record and playback. In each channel, we can record 340 – 680sec of voice clip in it. The module will have a microphone and a speaker output pins on it. We have to interface a speaker to get the recorded voice playback audible. There is a button for switching between the recording mode and playback mode. In either the mode we have to select the channel to record or playback. The selection of the voice channel can be done by grounding the particular channel pin among the eigth channels.

Fig 4: Voice Module

The vibration motor used for giving a vibration alert to the blind person. Here we used a low weight DC motor as vibration motor. To drive the DC motor, we have to interface a driver IC called ULN2803 or L293D. Because of the DC motor deserves more current compared to all other peripherals, the DC motor needs to get higher current driven from LPC2148 through driver IC.The 16x2 LCD is connected in this system is used for testing purpose. It is only used for testing the step by step implementation of the project as a blind people need to have a display.

IV. SOFTWARE DESIGN

The project needs two types of softwares in it. They are

1. KeiluVision
2. Flash Magic

The KeiluVision is the C and C++ compiler for various microcontrollers. In this we will have the required library managers for LPC2148. It is having the inbuilt editor, compiler and debugger for C/C++. The program written in the Keil is to be written on to the microcontroller's flash memory. The microcontroller will only accepts the machine level language. So, we have to convert the high level program code into machine level code. The Keil inbuilt it generates the Hex file which is a machine level language code all data in Hexadecimal format. The Flash magic is the tool for writing the code on to the LPC2148. The Hex file generated from the Keil is opened by the Flash magic and can be written in the Flash memory of the LPC2148. In addition, the Flsh magic is also having the internal terminal to interface the communication devices to the computer.

V. WORKING DESCRIPTION

The electronic guide cane with ultrasonic eyes is works as follows.

Initially the two ultrasonic sensors will always sends the trigger pulses while the person is walking. The ultrasonic sensor connected in the front position is connected to the LPC2148 as an external interrupt. If any obstacle is detected, the LPC2148 detects an interrupt and executes the Interrupt Service Routine which operates the vibration motor and voice playback. The ultrasonic module using for distance measurement is always analyses the distance from the object near by the person from back position which is in a range of ultrasonic sensor. If the distance is very less and object is too closer, immediately a voice playback will be out and vibration motor will be ON. The LPC2148 will manage all the peripherals connected to it. If the blind person feeling any unhealthy or in any emergency condition, he/she should press the rescue button connected in the system, then an SMS will be send to the predefined number in the controller.
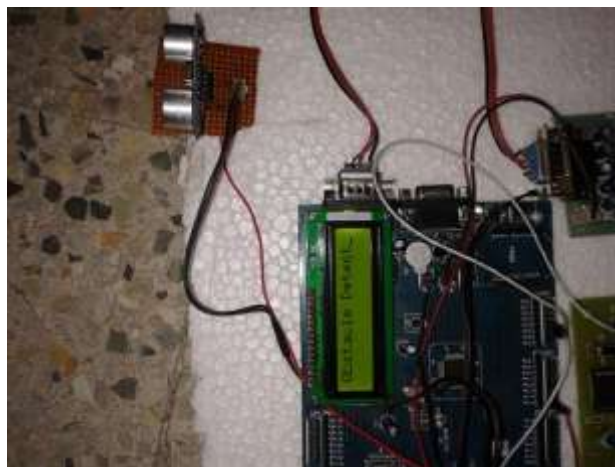
VI. RESULTS

The following figures shows the experimental results of the implemenated system.

Fig 5: Result When Object Is Near

The above figure shows the implemented system, while an object is coming near to the person.

Fig 5: Result When Obstacle Is Detected

The above figure shows the result when an obstacle is detected by the ultrasonic sensor fixed in front position of the blind person.

VII. CONCLUSION

The Electronic guide cane by using ultrasonic sensors is an efficient solution for blind people assistance. The system provides the real time obstacle avoidance for blind people while they are in traffic or in busy areas and let them accomplish their daily activities independently and safely.

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