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GSM based Voice and Vibration Alert System for Blind

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Abstract- Humans get most of their total information through eyes. Hence eyes contribute to a major part of the human's life. So with the advancement in the technology of both the hardware and software a low cost smart stick can be made to make the life of the visually impaired people easier and more comfortable. This paper presents a system concept and model to provide a smart electronic aid for blind people. This system is intended to provide the blinds with an aid, so that they can travel or go from one place to other with ease, without the need of an assistant to assist them where ever they go. This system basically aims at making a visually impaired person independent and swifter. Generally, the visually impaired people use a stick to avoid collisions and to locate the obstacles that comes their way. But due to certain limitations these sticks prove to be less efficient and frequent injuries are caused to the blind. To reduce the chances of any such injuries to the blind, this stick can be installed with some electronics equipments that work together to help the blind by making his journey easier, more comfortable and less prone to injuries. This system designed mainly consists of sensors, microcontroller, voice recording IC, speakers, vibration circuitry and a GSM module. All these are fixed to the stick making it a smart stick. Sensors sensing any obstacle alert the blind either via vibration circuitry or via speakers (voice driving unit). Further whenever the blind finds himself in trouble or finds himself lost he can use a panic button and GSM module to convey it to his near and dear ones via a pre stored message indicating his situation. In this way he is just a push away from his family.

Keywords- GSM module, Microcontroller(AT 89S52), Sensors, Voice Recording IC.

I. INTRODUCTION

The paper describes the design of "GSM based voice alert system for blind". This system has a stick which has sensors placed on it, these sensors are used to sense any kind of obstacle and level change that comes on the path of the blind and warns him about any such hurdle with the help of the vibrators, speaker or the headphone. Thus, prevents him from getting hurt or falling. Basically, the system uses two types of sensors IR proximity sensors (used to detect the left, right and front obstacles) and level sensor (to detect any change in the ground level). These sensors on the stick are interfaced with the microcontroller with the help of comparators. Whenever the sensors detect something these send a high pulse to the microcontroller, which processes the received signal and sends at the output pin a high pulse.

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A voice recording IC (APR 9600) is interfaced with the output pins of the microcontroller (hence indirectly interfaced with the sensors). When any of the input pin of the voice recording IC receives a high signal from the microcontroller, it plays the sound corresponding to the sensors saved in it. Same happens in the case of the obstacle sensors, whenever they detect a obstacle the switches ON's the corresponding vibrator indicating about the obstacle to the blind. The system also has a special button named as panic button. This button is mainly provided to help the blind in case of any emergency. This button is indirectly connected to a GSM module via the microcontroller. If the person finds himself lost he can press this button and at the same time a message pre-fed in the microcontroller will be sent to all the pre-fed numbers, telling them about the situation of the blind. In this way he can easily get help from his near and dear ones in case of any emergency. The person is just a push away from help from his family or friend.
This paper is organised as follows: the system design is explained in section 2. Section 3,4,5,6 presents the explanation of different units of the system. Section 7 explains the working of the system (using a flowchart). Section 8 concludes the research paper.

II. SYSTEM DESIGN

This system consists of four units:

- Obstacle detection unit(sensors)
- GSM unit(GSM module & panic button)
- Controller unit(microcontroller)
- Voice & Vibration unit(voice recording IC, vibrators and Speakers)

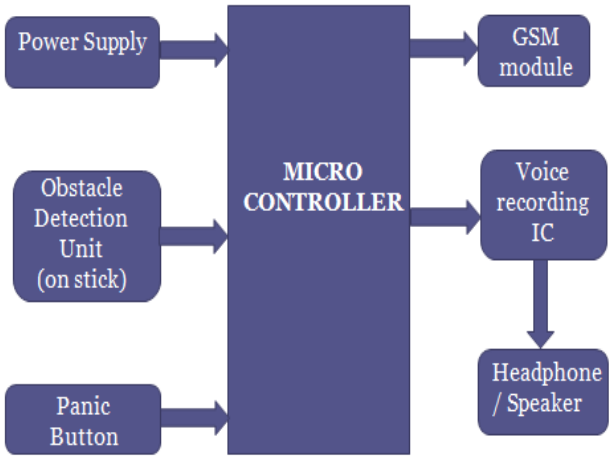

Figure 1. Proposed System

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The system design shown above consists of different modules. Out of these obstacle detection unit consists of two types of sensors namely Infrared Proximity sensor and level sensor. The power supply used is basically a 12v power supply which directly supplies the power to the system. As shown the different units are interfaced to the microcontroller directly and hence are connected to each other indirectly. The microcontroller is the heart of the system and controls the various operations going on in the system and is used to store different data. The GSM module is also connected to the microcontroller directly as shown it is used to send the message saved in the microcontroller to the pre-fed numbers, whenever he finds himself in trouble. The voice recording IC is used to store the voice and play the corresponding stored voice whenever it receives a high signal from the microprocessor. The vibrators vibrate when they receive a high pulse, from the microcontroller. Headphones or speakers are the output devices used to directly give the output in the form of voice to the person. These are directly connected to the voice recording IC as shown above.

III. OBSTRACLE DETECTION UNIT

This unit consists of sensors mounted on the stick and are connected to the microcontroller. The two types of the sensors used are infrared proximity sensors and the level sensor.

The IR sensors are three in number (each corresponding to left, right and front) and are concerned about detecting any kind of obstacle in the path of the blind person. If any obstacle is detected the IR sensor (transmitter and receiver circuit) senses an interrupt and sends a high signal to the microcontroller which processes this and further sends it to the APR9600, which in turn plays the corresponding sound(in case of level change) or to the vibrators which are directly connected to the microcontroller vibrates (in case any obstacle is detected) . These proximity sensors have a high reliability and long functional life because of the absence of mechanical parts and lack of physical contact between sensor and the sensed object. Hence, are very good for this project.

The other sensor used is the level sensor, it detects any change in the ground level. It basically is a tilt detector. In type of sensor we are using two metal sticks which are fitted in a small tube, half filled with water. Whenever there is a change in the level the water filled in the tube shorts the two metal sticks, which activate the APR 9600 circuit. Which plays the sound saved corresponding to the change in the level. This whole setup of sensors is placed on the stick.

IV. MICROCONTROLLER (AT89S52)

The AT89S52 is a low-power, high-performance CMOS 8-bit microcomputer with 4K bytes of Flash programmable and erasable read only memory (EPROM). The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional non-volatile memory programmer. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcomputer, which provides a highly flexible and cost-effective solution to many embedded control applications[14].

All the components are interfaced with the microcontroller. Microcontroller is programmed in such a way that all the connected components works together to give the desired output. The sensors output is compared with the ground or 0 level and is given as input at the input pins. At the output pins are connected components used to get output which are vibrators and APR9600 IC.

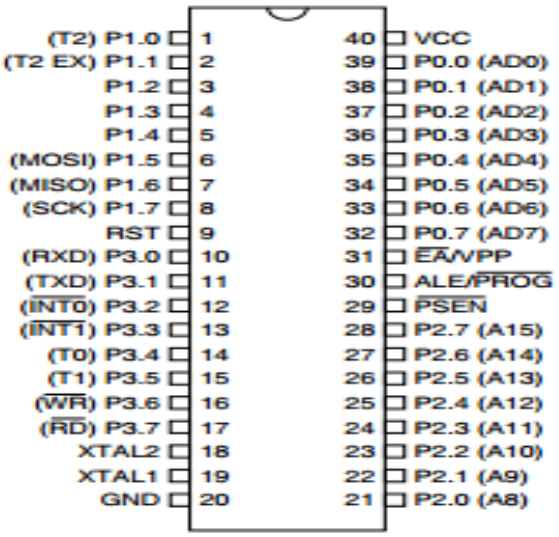

Figure.2 Microprocessor AT89S52

Features:

- 4K Bytes of In-System Reprogrammable Flash Memory[14]
- Endurance: 1,000 Write/Erase Cycles[14]
- Fully Static Operation: 0 Hz to 24 MHz[14]
- Three-level Program Memory Lock[14]
- 128 x 8-bit Internal RAM[14]
- 32 Programmable I/O Lines[14]
- Two 16-bit Timer/Counters[14]
- Six Interrupt Sources[14]
- Programmable Serial Channel[14]
- Low-power Idle and Power-down Modes.[14]

V. VOICE UNIT(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. The IC can be used to store more than 1 voice at a time. 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. [13]

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This technology enables the APR9600 device to reproduce voice signals in their natural form. It eliminates the need for encoding and compression, which often introduces distortion. [13]

This APR9600 IC is connected to the output pins of the microcontroller. Whenever the level sensor in the stick senses any change in the ground level it sends a high pulse to the microcontroller, which processes it and sends a high pulse to the corresponding output pin. To this pin voice recording IC is connected which on receiving the high signal plays the sound saved in the IC. The output of the IC can be taken from any kind of output device like speakers or headphone connected to pin number 14 and 15.

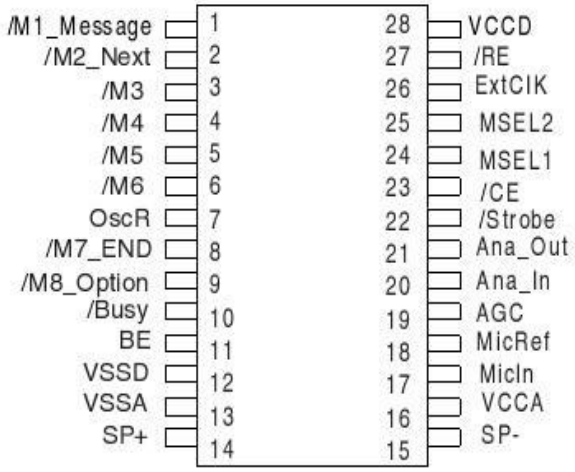

Figure 3. Voice recording IC APR9600

Features:

- Single-chip, high-quality voice recording & playback solution[13]
- Non-volatile Flash memory technology[13]
- User-Selectable messaging options[13]
- User-friendly, easy-to-use operation[13]
- Low power consumption[13]

VI. GSM UNIT

This unit mainly consists of a GSM kit (SIM 900) and a control button (panic button). This mainly comes under use in a situation when the person finds himself lost, this unit then helps him to share his inconvenience with his family and friends. In this way a blind is just a push away from his family whenever in a unfavourable situation.

As shown in the block diagram the GSM module is directly connected to the microcontroller. a push button is also connected to the microcontroller directly . And both these, the GSM module and the control button are connected to each other via microcontroller. When the blind finds himself in any unfavourable situation and presses the panic button a high pulse is sent to the microcontroller which then processes the signal and sends a high pulse to the GSM module which then sends a message stored in the microcontroller to all the pre-fed mobile numbers of the person's relative . In this way the person is always connected to his family and is just a click away.

VII. WORKING

The flowchart shown below shows the working of the proposed model of the GSM based voice alert system for blind. When the power is switched on all the units are initialised. If any obstacle is detected by the sensors the corresponding sound saved in the voice recording IC is played. In case if the panic button is pressed the GSM module sends the pre-fed message to the already saved numbers as shown.

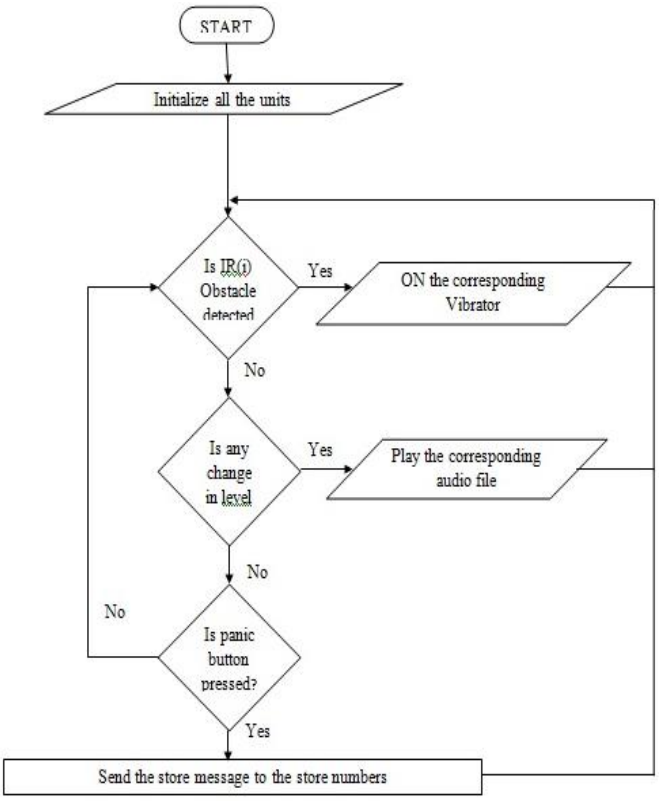

Figure 4. Flowchart

VIII. CONCLUSION

This system overcomes the limitations of the conventional sticks being used by the blind persons around the world. A stick of such type if made with the components described can prove to be a low cost solution for the problems faced by the blind in their day to day life. This stick can make the journey of the blind more comfortable and swifter. The stick also has the advantage keeping the blind just a click away from his family. This system can help the family of the blind to locate him and help him whenever he is in trouble. This whole system can is easy to use so there will be no problem for blind to adapt this technology.

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