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Electronic Travel Aid System for Object Detection and Navigation for Blind

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ABSTRACT:
This paper represents the designing of a navigational guidance plan for the blind population in the world. The paper presents a unique and innovative project design and implementation of sensors based object avoiding system and RFID based navigation system in order to provide complete and safe navigational route plan with audio notification to blind pedestrians. The object avoider is mainly the ultrasonic, Infrared and water sensor while RFID module is the navigation guide. APR sound system is used for voice guidance. Microcontroller is the key element of our prototype. The prototype designed is reliable, safe and cost-effective. The importance of our system is that it can be used as a stick and another feature related to it is that it can be found if lost through the RF module which is provided with the buzzer sound. The security feature of this system is whenever blind person feels trapped rather in a situation of fire or a disaster GSM gets activated and a rescue message is sent to the family members.

KEYWORDS: RFID module, Ultrasonic sensor, APR sound system, Microcontroller, GSM.

INTRODUCTION:

In present scenario the people with disabilities are also progressing despite of their weaknesses as technology is helping them in concurring their weak zones. This paper focuses on blind population among this disabled group. The paper is helpful for designing a prototype suitable for complete navigation in an apartment or building indicating the rooms and open areas .The prototype designed helps them in deciding their own route plan and navigate successfully without any physical damage. This prototype is self-sufficient as it assists them with suitable voice guidance. All the components like sensors (water, infrared and ultrasonic),Voice processor module(APR9600),RFID module ,RF receiver-transmitter module are interfaced to microcontroller ATMega 16. The series of operation starts with the detection of obstacles like stairs, walls, furniture, metal objects, water etc. through sensors. The Infrared sensor is used to detect the obstacle present in the small range with the help of Infrared radiation. The Ultrasonic sensor is used for detecting obstacles present in large range through the emission of ultrasonic radiation. Water sensor helps in detecting water in the path to save the person from accidents. All the sensors are connected to Microcontroller which passes their output to APR9600 and it produces audible voice at output. The work of navigation is done by RFID module and RFID tags, these tags are placed outside the rooms and whenever the stick touches the tag APR9600 produces the voice output according to the code fed into the microcontroller. This helps the blind person to navigate to destination point easily. The interfacing of RF module to ATMega 16 is helpful to locate the blind stick through the buzzer interfaced to the microcontroller. The interfacing of GSM to ATMega 16 is helpful in disaster situations (fire, earthquake etc) where a rescue message is sent to the phone number of the family member and they can take the person out of the building.

BLOCK DIAGRAM:

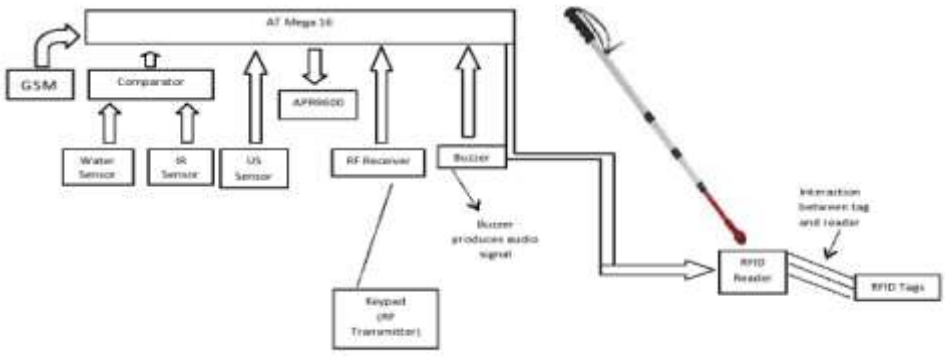

Fig.1

In order to explain the whole operation of the project we need to explain the blocks present in Fig 1.The ultrasonic sensor, water sensor and Infrared sensor are placed in the stick so that the audio output by APR 9600 is produced only when any obstacle comes in contact of stick. The output produced by the sensors when obstacle is detected passed to comparator for IR sensor and water sensor from where logic '0' is passed to Atmega 16 when water comes in contact with stick and APR9600 produces the sound "WATER". Similarly for IR sensor logic '1' is passed from comparator to Atmega 16 whenever Infrared radiation strikes object at a range of 2-7 cm and APR9600 produces sound "INTERRUPTION". Ultrasonic sensor is interfaced to Atmega16 and detects obstacle at 2-3 ft. range by Ultrasonic radiation of 40 KHz which strikes the obstacle and voice processor produces "LARGE OBSTACLE" output for it. RFID reader is placed at bottom of stick and whenever it comes in contact of RFID tags, scans the code from tags and APR circuit produces sound indicates the room i.e the destination of person in building. These tags vary according to number of rooms in building.

The RF receiver is interfaced to the ATmega16 and when the transmitter part present in remote sends signal to it a sound is produced from buzzer which helps in finding the stick when it is not found easily.

The interfacing of GSM to the ATMega 16 microcontroller's Tx and Rx pin at port D is useful in many situations like fire, earthquakes, lightning, power grid failures and system failure that is when route guidance is not provided properly. In this scenario a rescue message is sent to registered mobile number of the family member so that they can approach him and provide desired help.

PROGRAMMING OF A BLANK CHIP:

ATmega16 Microcontroller:

ATMega 16 is an 8-bit high performance microcontroller of Atmel's Mega AVR family with low power consumption. Atmega16 is based on enhanced RISC (Reduced Instruction Set Computing, Know more about RISC and CISC Architecture) architecture with 131 powerful instructions. Most of the instructions execute in one machine cycle. Atmega16 can work on a maximum frequency of 16MHz.ATmega16 has 16 KB programmable flash memory, static RAM of 1 KB and EEPROM of 512 Bytes. The endurance cycle of flash memory and EEPROM is 10,000 and 1,00,000, respectively.ATmega16 is a 40 pin microcontroller. There are 32 I/O (input/output) lines which are divided into four 8-bit ports designated as PORTA, PORTB, PORTC and PORTD.ATmega16 has various in-built peripherals like USART, ADC, Analog Comparator, SPI, JTAG etc. Each I/O pin has an alternative task related to in-built peripherals. The following table shows the pin description of ATmega16.

From BiPOM Electronics This fully integrated system includes: Micro-IDE - a Windows-based Integrated Development Environment Micro C - Optimizing AVR C Compiler, Assembler, Linker, Serial Loaders, Terminal, complete online documentation including C Tutorial, C Library Reference, Technical Manual and Project Examples. Fig.2 shows a general working window of this software.

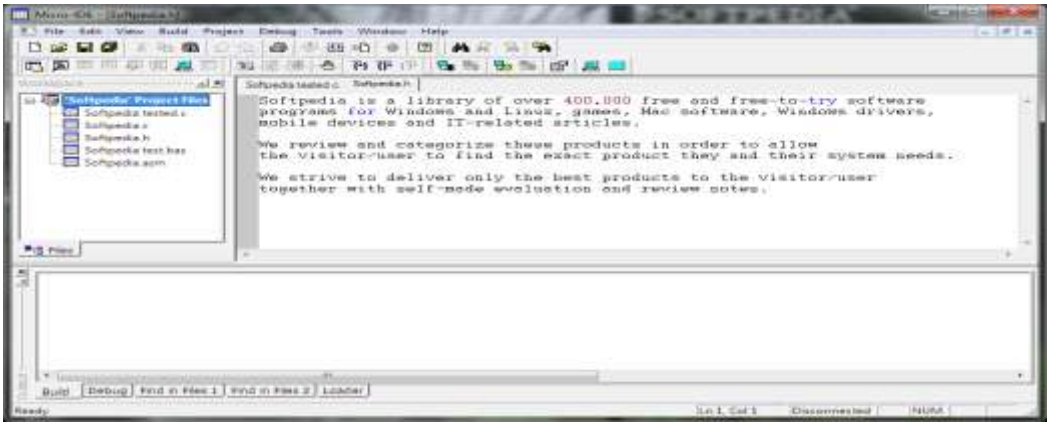

Fig. 2

RESULTS AND DISCUSSION:

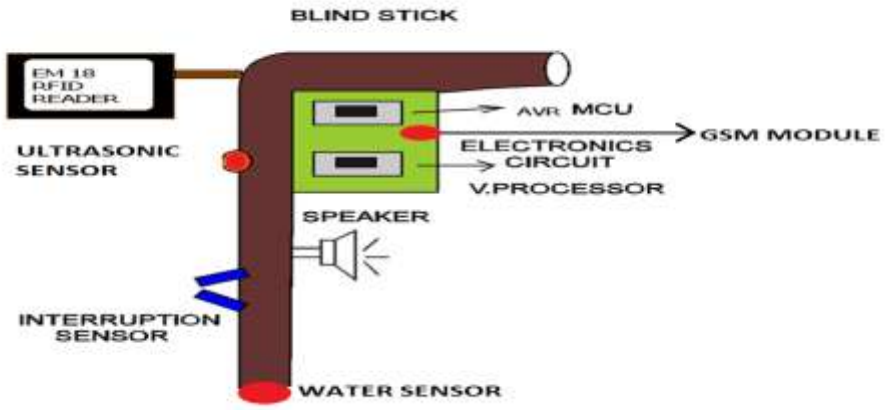

Fig-3

Fig-3 depicts the system model which can be implemented commercially. In this system most of the disadvantages have been rectified and a successful working model is framed which is handy in nature. It does not need any external support so it acts as a confidence booster for the person using it

CONCLUSION:

This paper has described a system which transformed the video information to audio information. The use of sensors and RFID module provides clear navigation route and avoids obstacles. The information gathered by sensors and RFID is transformed to audio signals by using the APR circuit and is amplified so that the audible frequency could be achieved. Apart from this navigational assistance a security feature added by GSM makes it more reliable. The presentation of this system as a stick helps in overcoming terrain restrictions and makes it portable. Addition of RF circuit helps in recovering the stick if lost.

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