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### An intelligent and highly secured walking stick for disabled people

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**Abstract:** The Blindness is frequently used to describe severe visual impairments with or without residual vision. The application of ultrasonic ranging scheme for producing electronic walking stick for the blind is a technological advancement. There is a great dependency for any type of movement or walking within area or out of the particular area, they use only their natural senses such as touch or sound for identification or walking .To overcome all these problems of blind people, need to develop a project by using simple available technologies. This walking stick for blind people which have multiple sensors, with the help of sensors it has possible to enhance more features to the walking stick. The features are to detect the obstacle for collision avoidance, it detects the object in directions up, down and front. The other sensor placed near bottom tip of the walking cane to find the pits on the ground. Integrate these sensors to the voice record and play chip. Voice record in the different tracks; respond for different sensors to give the audio message to the blind person by the speaker to alert. In this project, sensors plays key role to detect the objects in all directions to make free to walk for the blind people. A dedicated switch is to get the position of the device and send it others through global system for mobile communication (GSM).

**Keywords:** Blind walking stick; Distance measuring sensor; Microcontroller; Global positioning system.

#### I. INTRODUCTION

Blindness is a state of lacking the visual perception due to physiological or neurological factors. The partial blindness represents the lack of integration in the growth of the optic nerve or visual centre of the eye, and total blindness is the full absence of the visual light perception. In this work, a simple, cheap, friendly user, smart blind guidance system is designed and implemented to improve the mobility of both blind and visually impaired people in a specific area.

The proposed work includes a wearable equipment consists of light weight blind stick and sensor based obstacle detection circuit is developed to help the blind person to navigate alone safely

and to avoid any obstacles that may be encountered, whether fixed or mobile, to prevent any possible accident. The main component of this system is the infrared sensor which is used to scan a predetermined area around blind by emitting reflecting waves. The reflected signals received from the barrier objects are used as inputs to microcontroller. The microcontroller is then used to determine the direction and distance of the objects around the blind. The main objective of this project is to develop an application for blind people to detect the objects in various directions, detecting pits and manholes on the ground to make free to walk. This system presents a concept to provide a smart electronic aid for blind people. The system is intended to provide overall measures artificial vision and object detection, real time assistance via global positioning system (GPS). The aim of the overall system is to provide a low cost and efficient navigation aid for blind which gives a sense of artificial vision by providing information about the environmental scenario of objects around them. In this system embedded system plays a major role. In this system we are using the Ultrasonic sensor, temperature sensor, humidity sensor, GPS receiver, Vibrator, Voice synthesizer, speaker or headphone, microcontroller and Battery.

#### II. RELATED WORK

Basically an embedded system integrating the following components: pair of infrared sensor, the horizontal one to detect obstacles in front of the blind in the range of 200 cm, the inclined infrared sensor to detect obstacles on floor, upward and downward stairs. Both infrared sensors collect real time data and send it to 16F877A microcontroller to process this data. When the infrared signal is received at the microcontroller, it begins to compare between transmitted and received signals to identify obstacles standing in the way of

the blind. If the microcontroller finds a difference in the form and amplitude of transmitted and received signals, it invokes the appropriate speech warning message stored in ISD 1932 through an earphone.

ROM, as well as a typically small volume of RAM.

Microcontrollers are designed for embedded applications.

PIC 16F877A is made by Microchip technology as it's a family of modified Harvard architecture microcontrollers, derived from the PIC1650. PICs are widely used due to the following reasons:

- Low cost.
- Wide availability.
- Can be programmed by free tools.
- Can be re-programming with flash memory capability.

One of the PIC 16F877A main advantages is that each pin shares more than one function. It also contains a 40 pin out and many internal peripherals. The 40 pins can be used as multifunction if more than one external device is attached to MC.

As shown in Fig.2. When the MCU starts by generating the pulse that will drive the infrared emitters. After receiving the reflected wave, the A/D converter of MCU will read and convert the received analog wave from each infrared receiver into a digital signal.

If the received signal comes from the horizontal sensor, MCU will calculate the distance between the stick and obstacle.

If the inclined sensor received the signal, MCU will calculate average of the signal shape and its amplitude to detect the presence of stairs and direction of stairs (upward or downward).

After calculating the required information, MCU invokes the appropriate speech warning message through an earphone.

### III. METHODOLOGY

#### BLOCK DIAGRAM

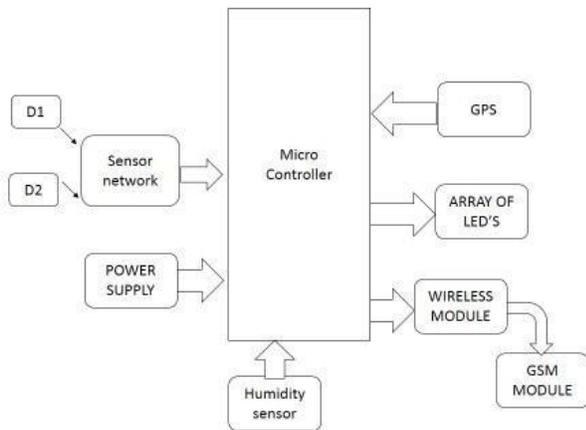


Figure Block Diagram

### WORKING DESCRIPTION

An intelligent and highly secured blind user walking with an electronic stick. An ultrasonic sensor is mounted on the stick having range from 20-350cms (set to different ranges). Two Infrared sensors are also implemented on the lower side of stick for avoiding small obstacles ranging from 2-10cms. A switch that can be operated with the thumb (in worst condition) that allows the blind user to send a general message (I am in trouble, help me) on a saved mobile no. for help. The box contain combination of GSM300/900 module and microcontroller circuitry. The co-operation between the Ultrasonic and IR sensors are utilized to create a complementary system that is able to give reliable distance measurement. The humidity sensor is used to detect the environment (moisture, water and heat), when it reach specified range it gives input to the controller. The LED strip used as a light source where the environment is dark through a dedicated switch.

The GPS unit is preferably coupled to an emergency communication and navigation system similar to those used With the ONSTARTM system to permit the user to receive the text message(I need a help) an information but also to transmit information about the position latitude and longitude in the event of an emergency.. The present invention provides a very convenient to visually impaired or sightless people. By incorporating a global communication device With a GPS unit, an electronic eye and a Wireless earpiece, the user can feel more secure that he or she has all that they need in order to go about their day with safety. The device provides the user with environment information permitting the user to know in, what are the obstacles.

The proposed device uses ISD1932 circuit that contains a multiple-message recording- and playback device. This circuit can record up to 64 seconds per message. It includes microphone inputs and speaker outputs. In the proposed system, eight different speech warning messages are recorded as listed to alert the user. To decrease recording duration to 21.2sec per message, a capacitor of 4.7 μF and an external resistor of 100K are added. The eight channel Audio playback and record device is used to eight different sounds, which will produce the output based on the input to the processor. If there is any obstacles on the way, it is detect through an ultrasonic sensor. And it is one of the input to the processor and the output will be an audio (It may be an object). In stair case detection, the IR sensor measure distance of first step (D1), then measuring the distance of second step (D2). Comparing the first and second distance, if the first distance is higher than the second distance the signal given to the processor and produce the voice channel output (Upstairs). If the first distance is lesser than the second distance is the signal to the processor and produce the third voice channel as an audio (Downstairs).

### ULTRA SONIC SENSOR:

Ultrasonic transducers are transducers that convert ultrasound waves to electrical signals or vice versa. Those that both transmit and receive may also be called ultrasound transceivers; many ultrasound sensors besides being sensors are indeed transceivers because they can both sense and transmit. These devices work on a principle similar to that of transducers used in radar and sonar systems, which evaluate attributes of a target by interpreting the echoes from radio or sound waves, respectively. Active ultrasonic sensors generate high-frequency sound waves and evaluate the echo which is received back by the sensor, measuring the time interval between the sending signals and receiving signal, the echo to determine the distance to an object. Passive ultrasonic sensors are basically mobile phones that detect ultrasonic noise that is present under certain conditions, convert it to an electrical signal and report it to computer.

### **HUMIDITY SENSOR:**

The humidity sensor is comprised of an integrated circuit (IC) with a stable polymer element and platinum RTD that is used for temperature compensation. Contaminant and chemicals, and is protected by a sintered stainless steel filter which resists condensation. A humidity sensor senses relative humidity. This means that it measures both air temperature and moisture. Relative humidity, expressed as a percent, is the ratio of actual moisture in the air to the highest amount of moisture air at that temperature can hold. The warmer the air is, the more moisture it can hold, so relative humidity changes with fluctuations in temperature.

### **VOICE RECORD AND PLAY BACK DEVICE:**

This circuit offers true single-chip voice recording, non-volatile storage and Playback capability for 40 to 60 seconds. It supports both random and sequential access of multiple messages. It can be used in three different modes. The device is ideal for use in portable voice recorders.

Digital recording and reproduction converts the analog sound signal picked up by the microphone to a digital form by the process of digitization. This lets the audio data be stored and transmitted by a wider variety of media. Digital recording stores audio as a series of binary numbers (zeros and ones) representing samples of the amplitude of the audio signal at equal time intervals, at a sample rate high enough to convey all sounds capable of being heard. Digital recordings are considered higher quality than analog recordings not necessarily because they have higher fidelity (wider frequency response or dynamic range), but because the digital format can prevent much loss of quality found in analog recording due to noise and electromagnetic interference in playback and mechanical deterioration or damage to the storage medium.

### **GPS/GSM MODULE**

The circuit is made simple by the adoption of a mobile phone module of Simcom and the SIMCom. The USB connection is implemented with the aid of a converter TTL /

USB type FT782M. Our modem is ideal to perform data links without access to the GPRS network or in any case to the Internet and allows, for example, the use in point-to-point mode, locators GPS / GSM or GSM only so as to obtain instantly data positioning and follow moves on live. In short, it allows direct data connection with another modem or mobile phone provider of a modem, but without going through the web: connections are made directly to the GSM data channel.

UART, I2C, CAN, and even USB. Low-power and high speed variations exist for many types.

### **PROCESSOR**

The **ATmega328** is a single-chip microcontroller created by Atmel in the mega AVR family. The Atmel 8-bit AVR RISC-based microcontroller combines 32 kB ISP flash memory with read-while-write capabilities, 1 kB EEPROM, 2 kB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10bit A/D converter (8-Channels in TQFP and QFP/MLF packages), programming watchdog timer with internal oscillator, five software selectable power saving modes. The device operates between 1.8-5.5 volt. The device achieved throughput approach 1 MIPS in Mhz.

### **IV. SUMMARY**

The Smart Stick acts as a basic platform for the coming Generation of more aiding devices to help the visually impaired to be safer. It is effective and afford. It leads to good results in detecting the obstacles lying ahead of the user in a range of four meters, detecting stairs and water pits. This system offers a low-cost, reliable, portable, low power consumption and robust solution for navigation with obvious short response time. Though the system is hardwired with sensors and other components, it's light in weight. Further aspects of this system can be improved via wireless connectivity between the system components, thus, increasing the range of the ultrasonic sensor and implementing a technology for determining the speed of approaching obstacles. While developing such an empowering solution, visually impaired and blind people in all developing countries were on top of our priorities.

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