Anti Collision Sensor Based Blind Stick

Akshay Meppurath, Akshay Monde, Nikhil Karadkar, Aditya Joshi, Ankur Ganorkar

***Abstract*--Visually impaired people find difficulties detecting obstacles in front of them, during walking in the street, which makes it dangerous. The smart stick comes as a proposed solution to enable them to identify the world around. In this paper we propose a solution, represented in a smart stick with ultrasonic sensor to detect any other obstacles in front, left and right of the user, within a range of four meters. Moreover, another sensor is placed at the bottom of the stick for the sake of avoiding puddles. The vibration of motor is activated when any obstacle is detected. The blind stick is integrated with ultrasonic sensor along with GPS &GSM based Navigation/Tracking system. This proposed system uses the microcontroller ATmega 328 embedded system. The stick is capable of detecting all obstacles in the range 4 meter during 39 ms and gives a suitable respect message empowering blind to move twice his normal speed because she/he feels safe. The smart stick is of low cost, fast response, low power consumption, light weight.**

***Keywords*: Ultrasonic sensors, microcontroller, visually impaired people.**

I. INTRODUCTION

The statistics by the World Health Organization (WHO) in 2011 estimates that there are 285 billion people in world with visual impairment, 39 billion of people are blind and 246 billion are with low vision, and around 15 million people are blind in India, The World Health Organization expects this number to increase in the coming years. This paper proposes the design and develops a portable unit (stick) for the blind people for easy use and navigation in public places. The most widely used stick is the long cane because it can feel the nature of the path and detect obstacles in the path of the blind person. Being an emerging area of research, a review of the most recent literature has been carried out. Blind stick is an innovative stick designed for visually disabled people for improved navigation. We here propose an advanced blind stick that allows visually challenged people to navigate with ease using advanced technology. The blind stick is integrated with ultrasonic sensor along with GSM and GPS module. Our proposed project first uses ultrasonic sensors to detect obstacles ahead using ultrasonic waves. On sensing obstacles the sensor passes this data to the microcontroller. The microcontroller then processes this data and calculates if the obstacle is close enough. If the obstacle is not that close the circuit does nothing. If the obstacle is close the microcontroller then it sends a signal to vibrating motor. With the rapid advancement of modern technology, both in hardware and software front have brought potential to provide intelligent navigation capabilities. Many blind guidance systems use ultrasound because of its immunity to the environmental noise. Another reason why ultrasonic is popular is that the technology is relatively inexpensive, and also ultrasound emitters and detectors are small enough to be carried without the need for complex circuit.

Akshay Meppurath,Student,Dept. of Electronic and communication ,RGIT, Mumbai, India 400053.
Akshay Monde, Student, Dept.of Electronic and communication , RGIT, Mumbai, India 400053.
Nikhil Karadkar, Student, Dept.of Electronic and communication , RGIT, Mumbai, India 400053.
Aditya Joshi, Student, Dept. of Electronic and communication , RGIT, Mumbai, India 400053.
Ankur Ganorkar,Asst Prof. Dept. of Electronic and communication , RGIT, Mumbai, India 400053.

II. WORKING PRINCIPLE

There are four sensors: Sensor1 measures the obstacle between the head and front side of the travelling path.Sensor2 measures the obstacle in the bottom direction for pits and floor based obstacles. Sensor 3 & 4 measures the obstacle in left and right of travelling path. TRIG and ECHO pins can be used to interface ultrasonic module with a microcontroller unit. Provide TRIGGER signal, at least 10µS High Level (5V) pulse. The module will automatically transmit eight 40 KHz ultrasonic burst. If there is an obstacle in-front of the module, it will reflect the ultrasonic burst. If the signal is back, ECHO output of the sensor will be in HIGH state for duration of time taken for sending and receiving ultrasonic burst. Pulse width ranges from about 150µS to 25mS and if no obstacle is detected, the echo pulse width will be about 38ms.To obtain the distance, measure the width of Echo pin. If the obstacle is detected, the microcontroller sends a signal to Relay switches which operate Vibrator. It also detects Panic Switches Input (Emergency Help Switches) and sends SMS to user Family member with User's GPS location. Here we are using the GSM module for sending the coordinates of blind man on mobile phone via message. GPS sends the coordinates continuously in form of string. After reading this string using Arduino extract the required data from string and then sends it to mobile phone using GSM module via SMS. This information is called latitude and longitude. A 16X2 liquid Crystal display is also connected with Arduino for displaying coordinate.

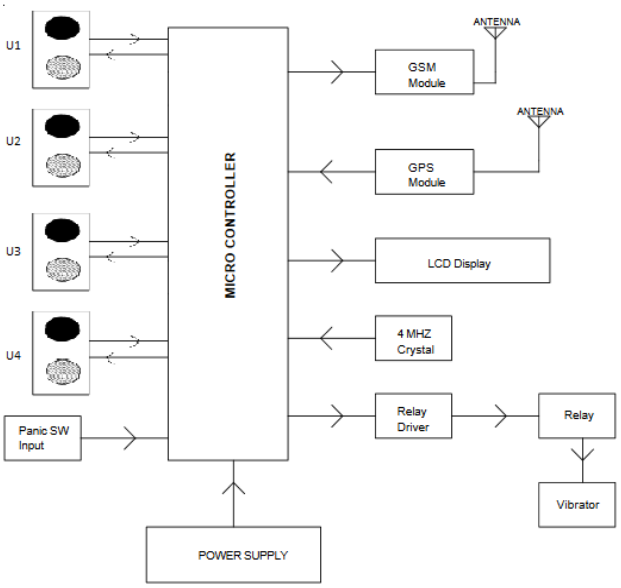
III. EQUIPMENTS REQUIRED

For this project the following equipments are required:

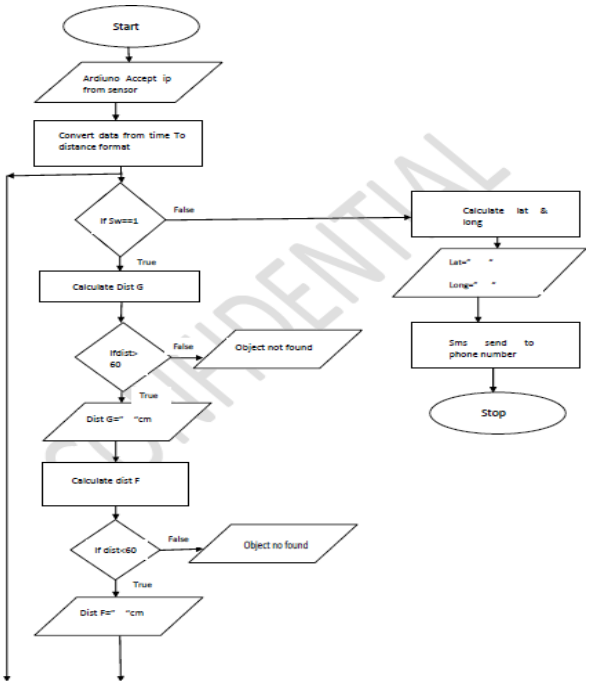
A. ATmega 328 microcontroller
B. Ultrasonic sensors

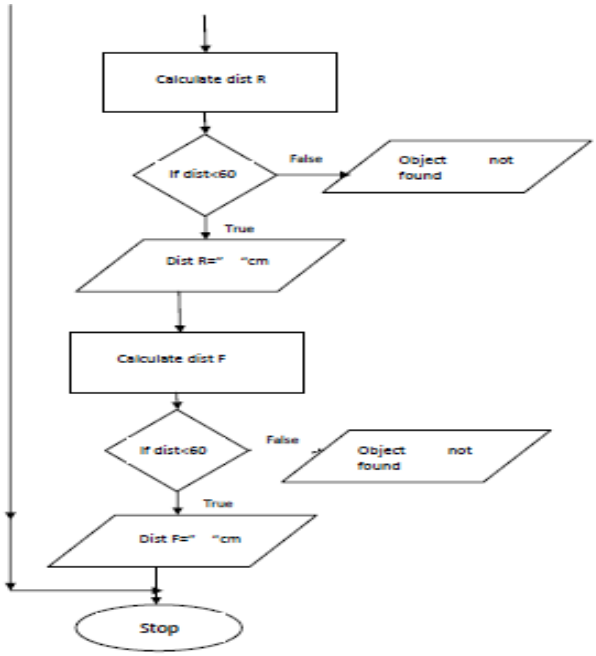
C. LCD 16x2 Display
D. GSM module
E. GPS module
F. Vibrator
G. Push button Switch
H. Regulated power supply

IV. BLOCK DIAGRAM



V. FLOWCHART





VI. COMPONENTS DESCRIPTION

A. Ultrasonic Sensor

Ultrasonic sensors work on a principle similar to radar or sonar which evaluates attributes of a target by interpreting the echoes from radio or sound waves respectively.HC-SR04 Ultrasonic Distance Sensor is a popular and low cost solution for non-contact distance measurement function. It is able to measure distances from 2cm to 400cm with an accuracy of about 3mm. This module includes ultrasonic transmitter, ultrasonic receiver and its control circuit.

HC-SR04 module has 4 pins**:**

1. VCC 5V +ve of the power supply
2. TRIG Trigger Pin
3. ECHO Echo Pin
4. GND -ve of the power supply

B. Microcontroller

The Atmega328 is 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 register, serial programmable USART,6-channel 10-bit A/D convertor. The device operates between 1.8-5.5 volts. The device achieves throughput approaching 1 MIPS per MHz.When the MCU is started, it produces a 40 kHz wave with the duration of 300µs. It generates the pulse that will drive the ultrasonic emitter. After sending the pulse, the ADC of MC will read and convert the received wave from each ultrasonic receiver into a digital form. If the ultrasonic sensor received the signal, MC will calculate the distance.

C. GSM Modem

A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network. While these GSM modems are most frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS.

D. GPS Module

GSM (Global System for Mobile Communications, originally Group Special Mobile), is a standard set developed by the European Telecommunications Standards Institute (ETSI) to describe technologies for second generation (2G) digital cellular networks. Developed as a replacement for first generation (1G) analog cellular networks, the GSM standard originally described a digital, circuit switched network optimized for full duplex voice telephony. The standard was expanded over time to include first circuit switched data transport, then packet data transport via GPRS (General Packet Radio services). Packet data transmission speeds were later increased via EDGE (Enhanced Data rates for GSM Evolution standards. "GSM" is a trademark owned by the GSM Association.

E. Vibrator

This is the type of DC vibration motors used in mobile phones. It requires a voltage supply of 3V to 5V with current around 125 mA. This type of motors can be programmed to control its speed by using the PWM (Pulse Width Modulation) method. The PWM signal is generated from the TMR2 timer via interrupt control on RC2 and RC1 pins to gate this PWM to active the vibration. The diameter of the motor is 0.5 cm and the thickness is 2.5mm**.**

VII. ADVANTAGES/FEATURES

1. Obstacles are detected and it able to recognize the upward and downward stairs or puddles.
2. Vibrator is integrated so that presence of obstacle is directly sensed by the blind person.
3. System is linked with GSM and GPS which provides geographic location.

ACKNOWLEDGMENT

We would like to express our gratitude to our project guide Prof. Ankur Ganorkar. We would like to sincerely thank our entire family for their moral support throughout the year.

REFERENCES

[1] Nandhini. N, Vinoth Chakkaravarthy.G, G.Deepa Priya,"Talking Assistance about Location Finding", l) International Journal of Innovative Research in Science, Engineering and Technology, Vol. 3, Issue 2, Pages 9644-9651, ISSN: 2319-8753, February 2014.

[2] Harshad Lele, Viten Lonkar, Varun Marathe, Mrunmayi Modak,"Electronic Path Guidance for Visually Impaired People", The International Journal of Engineering and Science (IJES), Vol.2, Issue 4, pages 09-12 ISSN: 2319-1813, 2013.

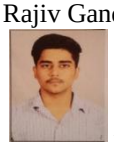
[3] D.Sekar,S.Sivakumar,P.Thiyagarajan,R.Prem Kumar,M.Vivek Kumar, "Ultrasonic and Voice Based Walking Stick for Blind People",International Journal of Innovative Research in Electrical.Electronic,Instrumentation and Control Engineering,Vol. 4, Issue 3,Pages 223-225, ISSN:2321-2004,March 2016.

[4] Mohd Helmy Abd Wahab,Amirul A.Talib,Herdawatie A.Kadir,Ayob Johari,A.Noraziah,Roslina M.Sidek, Ariffin A."Smart cane: assistive cane for visually impaired people", IJCSI, Vol.8 Issue 4, Pages 21-27, ISSN: 1694-0814, July 2011.

[5] Abhishek Bhokare,Amruta Amberkar,Anvesh Gawde,Pratham Kale,Abhijeet Pasi,"Ultrasonic Blind Walking Stick", International Journal on Recent and Innovation Trends in Computing and Communication,Vol.4 Issue 1, Pages 62-65,ISSN:2321-8169,January 2016.

Author Profile

 **Akshay Meppurath** pursiung B.E(Final) from Rajiv Gandhi Institute Of Technology of Mumbai.

 **Akshay Monde** pursiung B.E(Final) from Rajiv Gandhi Institute Of Technology of Mumbai.

 **Nikhil Karadkar** pursiung B.E(Final) from Rajiv Gandhi Institute Of Technology of Mumbai.

 **Aditya Joshi** pursuing B.E(Final) from Rajiv Gandhi Institute of Technology of Mumbai.

 **Ankur Ganorkar** Asst. Professor of Rajiv Gandhi Institute of Technology of Mumbai.