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Smart Electronic Walking Stick for Blind People

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ABSTRACT: Nowadays the blind and impaired people are suffering a lot because there are so many struggles for blind peoples to reach their destination and also there are dangerous risks that blind persons must face. To avoid uncomfortable walking experience, we have designed a smart electronic walking stick for blind people. Our paper proposes a low-cost walking stick based on latest technology and a new implementation are made for efficient interface for blind people. Basically, the ultrasonic sensor is implemented in the walking stick for detecting the obstacles in front of the blind/impaired persons. If there are any obstacles, it will alert the blind person to avoid that obstacles and the alert in the form of buzzer. daily in different aspects in order to provide flexible and safe movement for the people. In this technology driven world, where people strive to live independently, this paper propose a low-cost 3D ultrasonic stick for blind people to gain personal independence, so that they can move from one place to another easily and safely. A portable stick is design and developed that detects the obstacles in the path of the blind using ultrasonic sensors. The buzzer and vibration motor are activated when any obstacle is detected. In addition, the stick is equipped with GPS and SMS message system. GPS system provide the information regarding the location of the blind person using the stick to his family members. SMS system is used by the blind to send SMS message to the saved numbers in the microcontroller in case of emergency. The programming of GPS modem, GSM modem, buzzer and vibration motor has been successfully done for this system. Computer simulation is done to essence the performance of the system using Proteous software.

KEYWORDS: Arduino Uno, Arduino IDE, Ultrasonic Sensor, GPS, GSM, LM35.

I. INTRODUCTION

Independence is the important methodology in achieving objectives, dreams and goals in life. Visually impaired/blind persons find themselves challenging the dangerous paths to go out independently. There are millions of visually impaired or blind people in this world who are always need the help from others. For many years the normal walking stick became a well-known attribute to blind person's navigation and later efforts have been made to improve the walking stick by adding remote sensor. Blind people have big problem when they walk on the street or stairs using normal walking stick, but they have sharp haptic sensitivity. The electronic walking stick will help the blind person by providing more efficient and convenient means of life.

Moving through an unknown environment becomes a real challenge for the blind or impaired people. Those who go out from the house with the white stick, often use well-known routes and difficulties with new ones. Moreover, many people simply afraid of being helpless in constant movement of people, vehicle and other road users. It is therefore advisable to offer new solutions of the problems with existing technologies. This paper proposes the design and develops a portable stick for a blind people/impaired people for convenient use and navigation in public and private places.

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II. LITERATURE SURVEY

Jismi Johnson et al., (2013), presents the smart walking Stick helps blind people in moving and allowing them to perform their work easily and comfortably. The blind person cannot recognize what is the size of that object and how far is he from the object. So, it is difficult for blind person to move here and there. The smart walking stick supports Object recognition and output comes mainly in the form of Voice output. In Smart Walking Stick, we detect the object with the help of a camera. The stick measures the distance between objects and Smart Walking Stick by Ultrasonic sensor. When the objects or obstacles come in range of the ultrasonic sensor, the speaker tells Name of obstacle in front of the stick. Images will be captured using a camera and the camera is connected to the Raspberry Pi. If any obstacle comes in front of blind person, he can know about the obstacle by hearing the sound generated by the head phone. The smart walking stick is very useful for the visually impaired persons for their safety and freedom from the other persons at all the time.The developed system gives good results in detecting obstacles in front of the user [1].

K. Ramarethinam et al.,present the project is to provide the navigation information via audible messages and hapticfeedback to the visually impaired people helping them to improve their mobility independently. The system withportable self-contained feature that allows the blind people to travel through familiar and unfamiliarenvironment. The proposed system consists of hardware and software. In this system the Braille capacitivetouch screen enables a user-friendly communication with the systems. All the operations can be made with thistouch screen. The major components are the GPS receiver and path detector used for receiving the currentposition and finding the current position and finding the shortest path to the destination. The navigation processof the system will start once the user gives the destination as voice command. The system is provided with anemergency button which will trigger an SMS that will send the present location of the user (GPS coordinates) toa remote phone number asking for help, in case emergency. In addition, the device provides user informationneeded, in audio format, including time, calendar, object colour, alarm, obstacle detection, navigation direction,ambient light and temperature conditions. This project will help the blind people in improving theircommunication ability and not to depend on none during walking in even unknown areas [2].

Kher Chaitrali S et al., (2013), presents the visually impaired have to face many challenges in their daily life. The problem gets worse when they travel to an unfamiliar location. Only few of the navigation systems available for visually impaired people can provide dynamic navigation through speech output. In this paper, we propose a navigation device for the visually impaired which is focused on providing voice output for obstacle prevention and navigation using infrared sensors, RFID technology, and android devices. The device has proximity infrared sensors. RFID tags are installed into public building and also integrated into blind person's walking stick. This device is connected to an android phone through Bluetooth. An android application is designed which gives voice navigation based on RFID tags read and also updates person's location information on the server. One more application is designed for family members to access the blind person's location through the server whenever needed.It aims to solve the problems faced by the blind people in their daily life. The system also takes measures to ensure their safety [3].

Jini.S et al., paper presents the architecture and implementation of a system that will help the visually impaired people to navigate using GPS technology. The system provides artificial guidance to the visually impaired through known paths, that is the path for navigation has to be already stored in the microcontroller. The current latitude and longitude values of the user are obtained using GPS. These values are continuously compared with the already stored value in the microcontroller. Thus, helps the blind in navigation. The goal is to create a portable, simple and less costly system that will allow user to travel through familiar and unfamiliar environments without the aid of guides. Also, it provides voice recognition to detect obstacles. The obstacles are detected using three ultrasonic sensors, which are placed on the left, right, and front positions of the blind. The commands and messages are played back to the blind via APR9600 voice playback IC. The keypad used in system allows the user to select the desired locations to which he/she wishes to go. Keypad consists of 12 keys where each key represents a location. Blind selects the key using Braille language. The paper focuses on the development and evaluation of a Navigation system that makes use of Global Positioning System, voice and ultrasonic sensor for obstacle detection. [4]

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III. POWER CIRCUIT

The input voltage should be between 9V and 12V DC and the current must be rated for a minimum of 250mA current output, although you will likely want something more like 500mA or 1A output, as it gives you the current necessary to power a servo or twenty LEDs if you want to. There must have a 2.1mm power plug on the Arduino end, and the plug must be "centre positive", that is, the middle pin of the plug must be the + connection.

IV. SIMULATION MODELLING OF COMPONENTS

In this simulation, Arduino board, GSM, WIFI, heartbeat sensor, temperature sensor, water sensor, ultrasonic sensors are present. The water sensor is connected to the Arduino pin (PC0) and this sensor is used to sense the water. If there is any water content present in the water sensor it will give the input signal to the Arduino controller and through Arduino board we can get the output via buzzer or vibration motor. Temperature sensor is connected to the Arduino pin(PC1) and this sensor is used to the sense the temperature of the body. If the temperature level exceeds than the normal body temperature, the sensor will sense and the output is displayed in the virtual terminal. Heart beat sensor is connected to the Arduino pin(PC3) and this sensor is used to sense the heartbeat rate of that particular person and it will upload to the cloud for the future analysis. GSM have both transmitter and receiver. Transmitter pin is connected to the Arduino pin(PD5) and the receiver pin is connected to the Arduino pin(PD6). Through GSM the guardian will get the message through mobile phone. The message through is the location of the blind person. Ultrasonic sensor is connected to the Arduino pin (PD3 and PD4) and this sensor is used to find the obstacles. If there are any obstacles in front of that blind people, the sensor will sense and send signals to the Arduino controller and the output through buzzer or vibration motor the person can find the obstacles. The output results show that the system can provide the required output notification (warning) to the user as sound or vibration while detecting the obstacles. The simulation shows that the interfacing of the GPS modem, GSM modem, WIFI, Heartbeat sensor, ultrasonic sensor and temperature sensor is successfully done.

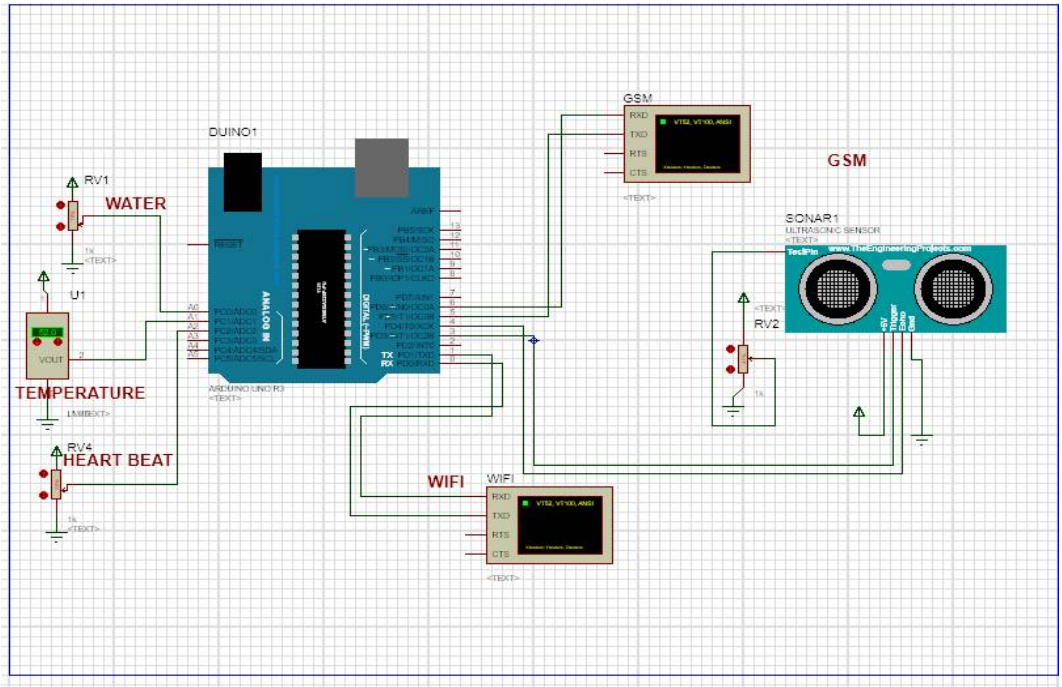

Fig. 1 Simulation Circuit of the smart walking stick using Arduino

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V. BLOCK DIAGRAM

In the block diagram, it is shown that the sensors and modules (i.e., the input and the output units) are interfaced with the Arduino UNO controller. The sensors are connected to Arduino as the input units and the output units are GSM module, WI-FI module and the buzzer. There are RF transmitter and receiver are also included. The purpose of the RF transmitter and receiver are used to find the stick by pressing the button in the transmitter unit and there will be an indication in the receiver unit. In the transmitter unit there is an encoded and in the receiver unit there is decoder.

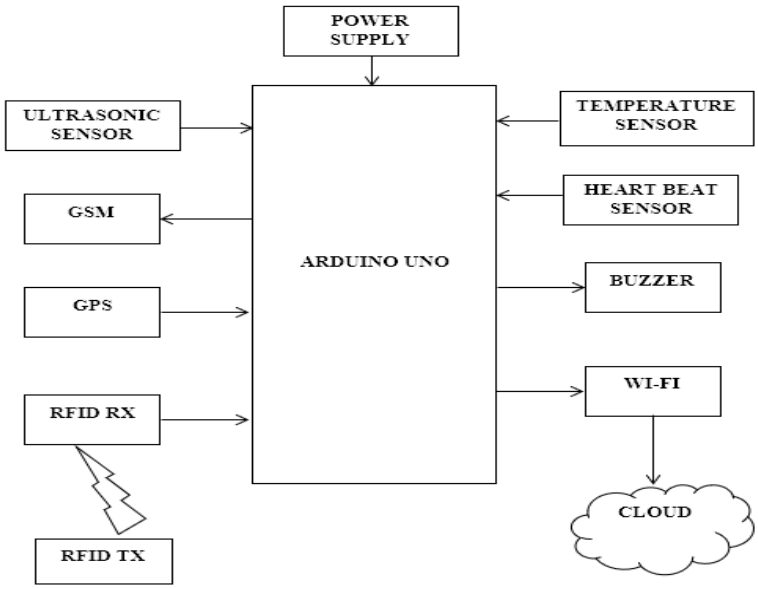

Fig. 2 Block Diagram of the smart waking stick using Arduino

VI. ARDUINO

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital Input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to Support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. The Uno and version 1.0will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions.

VII. ESP8266-12E WIFI MODULE

ESP-12E is a low power consumption of the UART-WIFI module, with very competitive prices in the industry and ultra-low power consumption technology, designed specifically for mobile devices and IOT applications, user's physical device can be connected to a Wi-Fi wireless network, Internet or intranet communication and networking capabilities. ESP-07 the use of small ceramic antenna package can support IPEX interface. users have a variety of installation options.

VIII. METHODOLOGY

Here we are using Arduino UNO as the controller. So, the input and output units are interfaced with the Arduino controller. The ultrasonic sensor is interfaced with Arduino as the input and the output for the ultrasonic sensor are in

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the form of sound through buzzer. The GPS and GSM are interfaced with Arduino controller through transmitter and receiver methodology. The function of the GPS to locate and the purpose of GSM is to share the location to the particular mobile number.

The heartbeat sensor and temperature sensor are also interfaced to check the health conditions. By pressing the emergency button in the walking stick the location, the heartbeat rate, and the temperature are uploaded to the Cloud. The water sensor also interfaced with Arduino controller so if there is any water in front of water and the water is interfaced with water sensor in the bottom of the walking stick, there is a buzzer sound to alert the blind person. The WIFI module are interfaced with the Arduino controller used for the internet connection for locating the location using GPS. Finally, there is RF receiver and transmitter that are mainly used to find the walking stick which works as wireless.

The Arduino is coded using Arduino IDE software. Based on the function of the Arduino the program was logically coded in the Arduino IDE software and checked for the errors. If there is any error it will be displayed in the message box. After removing the errors, the sketch can be compiled and run successfully. Finally, the sketch is uploaded into the Arduino controller through USB serial interface.

The pin details are A0 is connected to the LM35's (temperature sensor) output pin. The output pin from the water sensor are connected to the A1 Pin (analog pin). The signal pin from the heartbeat sensor are connected to the A2 (analog pin). The GPS transmitter pin are connected to the Arduino's receiver pin whereas Arduino transmitter pin are connected to the receiver of the GSM module. In Wi-Fi module the transmitter (Tx) pin is connected to the Digital 9^{th} pin while the receiver (Rx) pin is connected to the digital 10^{th} pin. For RF transmitter the digital 11^{th} pin is connected to the 5volt supply. Finally, the buzzer is connected to the 12^{th} pin.

IX. HARDWARE

The hardware consists of water sensor used for the detecting of water in front of the blind person. In this hardware it consists of two number of buzzers. One is for ultrasonic and water sensor and another one is for RF Receiver and Transmitter. The ultrasonic sensor is used to find the obstacles in front of the walking stick. The emergency button is also provided in the stick. If there is any emergency condition occurs for the blind person, the person needs to press the button once, and the location will be transferred to the guardian mobile phone. The temperature sensor is used to measure body temperature of the particular blind person. The GPS module is used to locate the blind person and GSM module is used the share the location to the particular mobile number.

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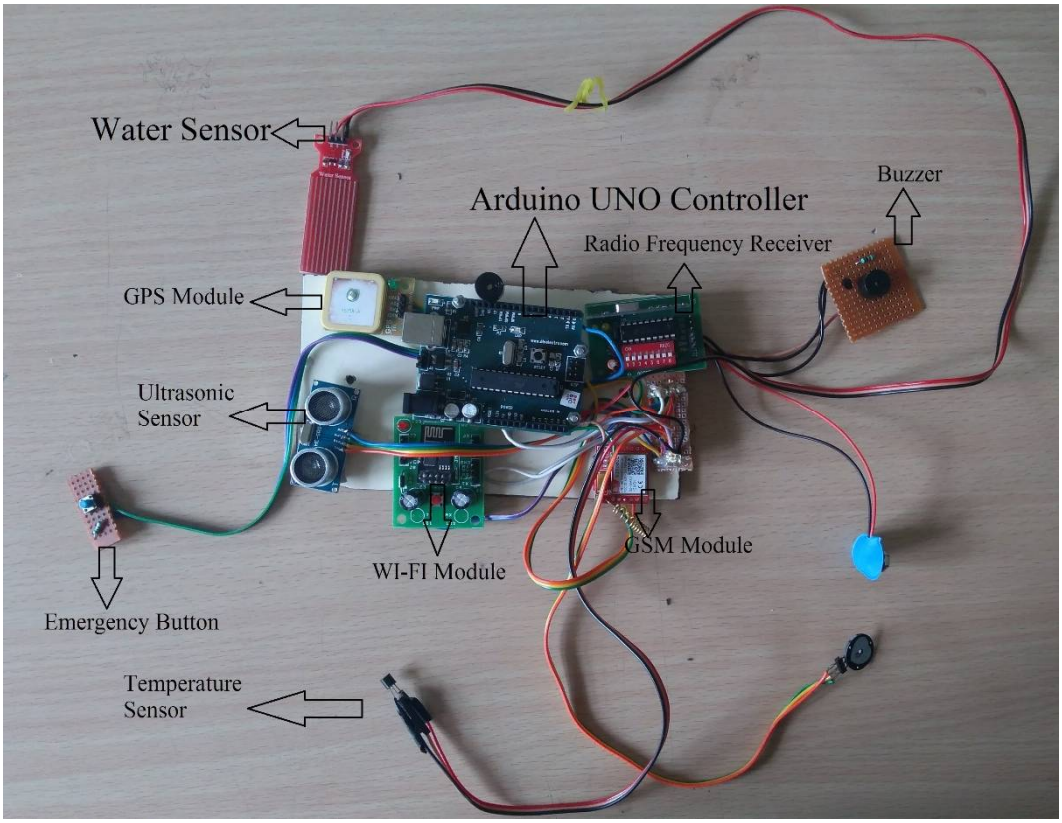

Fig. 3 Complete Hardware

X. RESULT AND DISCUSSION

The output was obtained using Proteus software. In this the temperature level, water level, distance between ultrasonic sensor and obstacles and heartbeat rate are displayed. The output is displayed using the virtual terminal component in the Proteous. In this it displays the temperature value in Celsius. The water sensor output is like yes or no. If there is water the information will be yes otherwise the result is no. In hardware if there is water it will give an alert through buzzer otherwise there is no alert. The ultrasonic sensor displays the distance between the ultrasonic sensor and the obstacle. It will show the value in centimetre. The heartbeat sensor displays the heartbeat rate of the blond person for a constant period of time. This value will be continuously uploaded to the cloud after a constant time interval.

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Fig. 4 Results Obtained in Proteus

XI. CONCLUSION

The system was simulated by using Proteous software. The program code was written by using Arduino IDE. The vibration motor only will activate if the distance is less than 50cm from the obstacle. The simulation results are expected for the ultrasonic sensors, WIFI, Heartbeat sensor, temperature sensor and for integrated GPS and the GSM modem in one Arduino board. However, this system having the delay while detecting the obstacles between 2 to 4 second. The delay for the GPS to get the location for the stick is around 30 seconds to 0ne minute. In addition to that, GPS system cannot be used for indoor because of the GPS signal will be too week. Many features are used to develop our project to help the visually impaired people. The proposed system is economical and efficient in comparison with the similar system developed so far

REFERENCES

[1] Jismi Johnson, NikhalRajan P, Nivya M Thomas, Rakendh C S, Sijo T Varghese, "Smart Walking Stick for Blind", International Journal of Engineering Science Invention Research & Development; Vol. III, Issue IX, pp. 557-560, March 2017
[2] K. Ramarethinam, Mrs K. Thenkumari, [Assist.Prof], P.Kalaiselvan, "Navigation System for Blind People Using GPS & GSM Techniques ," International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering , Vol. 3, Special Issue 2, pp.398-405, April 2014
[3] Kher Chaitrali S., Dabhade Yogita A., Kadam Snehal K., Dhamdhere Swati D., Deshpande Aarti V., "An Intelligent Walking Stick for the Blind," International Journal of Engineering Research and General Science Volume 3, Issue 1, January-February, pp.1057-1062, 2015
[4] Jini.S, Swetha.P, Akshara.P.S, Jishnu S, Karthik Selvan, "Voice Maps for Visually Impaired with Obstacle Detection," International Journal on Recent and Innovation Trends in Computing and Communication, Volume: 4 Issue: 3., pp.14-16, March 2016.
[5] ShubhanAdhe, SachinKunthewad, Preetam Shinde, Mrs. V. S. Kulkarni, "Ultrasonic Smart Stick for visually Impaierd People," IOSR Journal of Electronics and Communication Engineering
[6] Deepika S, Divya B.E, Harshitha K, Komala B.K, Shruthi P C, "Ultrasonic Blind Walking Stick," International Journal of Advance Electrical and Electronics Engineering (IJAEEE)
[7] Osama Bader AL-Barrm, Jeen Vinouth, "3D Ultrasonic Stick for Blind," International Journal of Latest Trends in Engineering and Technology Vol. 3 Issue 3 January 2014
[8] A.Sangami, M.Kavithra, K.Rubina, S.Sivaprakasam, "Obstacle Detection and Location Finding For Blind People," International Journal of Innovative Research in Computer and Communication Engineering, Vol. 3, Special Issue 2, March 2015
[9] Ankit Agarwal, Deepak Kumar, Abhishek Bhardwaj, "Ultrasonic Stick for Blind," International Journal of Engineering and Computer Science, Volume 4 Issue 4 April 2015, Page No. 11375-11378
[10] 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 Volume: 4 Issue: 1
[11] Javier Sánchez Sierra, Joaquín Selva Roca de Togores, "Designing Mobile Apps for Visually Impaired and Blind Users," ACHI 2012: The Fifth International Conference on Advances in Computer-Human Interactions
[12] Mounir Bousbia-Salah, Mohamed Fezari, "An Electronic Travel Aid for Blind People," IMACS'2005
[13] Shashank Chaurasia and K.V.N. Kavitha, "An Electronic Walking Stick for Blinds," International Conference on Information Communication & Embedded Systems (ICICES 2014).