Sensor Based Smart Stick for Blind Person Navigation

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Abstract*— *God's perception of people is an important part of our lives. Only in this way, happy and unhappy people can distinguish the Blessings of God. On the other side, blind people choose to rely on others to travel and other bodily functions. The purpose of this paper is to provide a theoretical and hardware model that combines the latest technology to provide effective and intelligent electronic help for those with no vision. We use an ultrasonic sensor to help the blind by observing obstacles around him and use a color detection sensor to measure the specific path they will use. A Bluetooth module using GPS technology and the blind Android mobile app will provide the required location and, in the event of a panic, send an SMS alert to the registered contact number. The system will provide the blind with practical and simple navigation aids that will help with artificial vision.

Keywords—Blue-tooth Module, Android Mobile Application, Ultrasonic Sensors, Colour Sensor, Micro-controller, 9v DC, Vibration motor

I. INTRODUCTION

Vision is a major part of human physiology because 84% of human information leaves the environment through sight. According to the statistics of the World Health Organization (WHO) in 2011, there are 285 billion visually impaired people in the world, of which 39 billion are blind and 246 are amblyopia. For people with visual impairment, traditional and elderly walkers are white canes and guide dogs. The most important shortcomings of these aids are basic skills and preparation phases, range of motion and little information. With the rapid improvement of modern engineering, both intelligent hardware and software provide intelligent navigation. Recently, an electronic travel tool (ETA) was designed and prepared to help blind people navigate independently and safely. [1].

People with visual impairment are exposed to people with low vision. They may be blind or visually impaired. These conditions often limit people's ability to perform routine tasks and influence their current tone. Blindness can be caused by illness, injury or other conditions that limit vision. The Iowa Department of the Blind said that legal blindness means that a person has a vision of 20/200 or less. For the object course, a person with a 20/200 view picks up objects at a distance of 20 feet, and a person with a perfect 20/20 view can pick up at a distance of 200 feet [2]. Recognizing the challenges posed by blindness can help visually impaired people understand the problems that blind people face every day. People who are blind or have impaired vision are often difficult to move outdoors in known environments.

Every other day we get report about person is missing; most of them include unsighted people. It is very complicated for vision-less to move alone. There is possibility of their missing, in such cases it is truely hard for their relatives and family to see them.

The focus of this paper is to support vision-less peoples to carefully run in between obstacles and other hazard faced by them in their regular life.

II. LITERATURE SURVEY

The blind stick is an influential project that is constantly increasing and changing. Currently, commercially available blind sticks do not have much impact due to their high cost and lack of transparency. The first project on similar concepts [3] proposed a method for using smart keys for people without vision: to determine obstacles, illusory vision and real-time assistance through GPS.

[4] Blind people's comparison exercises use pulse echo technology, which provides an alarm sound when detecting objects. This technology was used by the US Army to discover submarines. When you

beat the rough surface they produce echoes, the ultrasonic range of these pulses is 22 kHz to 51 kHz, but the power requirements are quite large.

At present, many techniques [5] have been invented to improve the mobility of blind people based on signal processing and sensor technology. These are called Electronic Travel Assistance (ETAs), which help people without vision to move freely in the environment, no matter how much change they make. [6].

From this paper we got idea about latest technology like Graphics Positioning System (GPS) & Graphics System Messaging (GSM) [7]. Which will help for tracking the location & used for making module of smart stick for visually impaired people and it gives us idea about text message sent from android mobile to blind person [8].

We got idea from this paper for Text message & Vibration when person detect obstacle with help of smart stick then blind person get aware to it by understanding Vibration alert if the obstacle on right the right vibrator will vibrate and vice versa [9].

From this paper we got idea about GSM, GPS & of sensor like Ultrasonic sensor. Which one is more suitable & how they are perform & how they detect obstacle [10].

III. SYSTEM DESIGN

1. Micro-controller Unit
2. Obstacle Detection Unit
3. Blue-tooth Module link with Android Mobile
4. Smart Phone

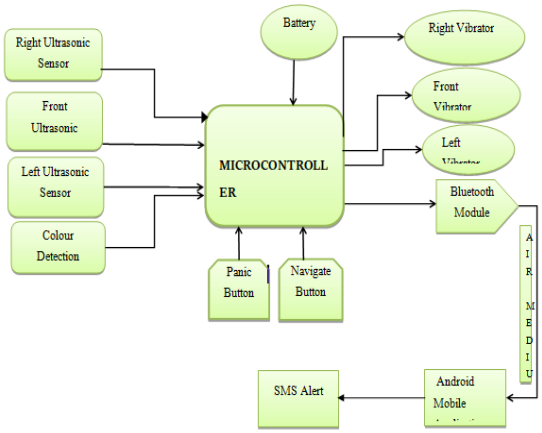

Figure1-Block Diagram

1) Micro-controller Unit**:** The main purpose of selecting this component is that it is a 4 KB flash that can be reprogrammed a thousand times. It is a 40-pin integrated circuit that provides 5V supply for pin 40, pin 20 and the oscillator. 11.0592 MHz between pins 18 and 19 and two capacitors Pico-farad 22. The power to start the program on pin 9 is determined by the 5V supply and the capacitor 10micro farad. The resistance is 10 k ohms. We have a dedicated pin number 3Rx on the ultrasonic sensor that has an approximate obstacle distance. Secure Port 1.0 on the left sensor and port 1.1 on the right ultrasonic sensor are used to receive the trigger when an obstacle is detected. The medical button in case of a distress is connected to port 1.2. Port 2 is connected to the relay contacts by two transistors. Once the obstacle is identified, current flows into a current limiting resistor at the bottom of the two transistors that magnetizes the relay coil and then triggers the vibrating motor.

2) Obstacle Detection Unit**:** Three ultrasonic sensors are used on the stick left, right and front. The ultrasonic sensor consists of transmitter and receiver. First the transmitter conveys an ultrasonic wave, which actions in air and when it becomes objected with any obstruction it gets reflected back towards the sensor the reflected wave is then observed by the receiver portion and accordingly vary

vibrator vibrates and alarm the blind person to change his/her path.

3) Blue-tooth Module link with Android Mobile**:** HC-05 model is linked with the application in the mobile. Android application through common GUI of two knobs that are nnavigate and panic buttons respectively. These buttons help the vision-less in difficulty.
4) Smart Phone**:**In second part of system is smart phone which is carried by blind person and which contain fast speed internet along with Android Application.This device plan an important role, this phone can carried by blind person when any accident happens or if the blind person lost his way by pressing the panic button the relative of blind will receive a message with his location

IV. METHODOLOGY AND IMPLEMENTATION

The power required for the Micro-controller is +5V and is generated by using 9V battery.The project hardware and android Mobile Application will work together to achieve its task. First we scan the distance on hardware part using Ultrasonic sensors then we will check if it are too close then send pulse to vibrator to tell the user there is an obstacle ahead.Three vibrators are placed so that when the blind wants to move forward, left or right and an obstacle is on the way the vibrator will vibrates and then he/she will change his path from that way. Blue-tooth component Using a GPS device and an Android mobile app for non-visual vision will provide the appropriate location, and in the event of a panic, an SMS notification will be sent to the registered contact number.We will monitor the panic button if user press the panic button if an accident happens it will send a trigger command to the android mobile application through blue-tooth ,using GSM connection in application it will take its current location and send to the desired number which will we want to receive our message.colour sensor has been used at the bottom of the stick to detect the presence of a red colour and identify its exact coordinate across the full colour spectrum,if he/she left the colour spectrum the vibrator will vibrate in such case.

Figure2

Direction	Hurdle Recognition		
	Sensor Used	Distance Range	Vibration
Front	Ultrasonic Sensor	100-75 cm	250ms(V)
Left	Ultrasonic Sensor	60-50cm	200ms(V)
Right	Ultrasonic Sensor	60-50cm	200ms(V)

Table1

V. CONCLUSION

Therefore, the authors proposed the concept of system planning and smart phones, and it is very easy to use for users without vision. For blinds and physically disable persons in our country no as such arrangements are there. Although they also have the same rights as ours and they also want to enjoy life as we do. Our aim to design a project for blinds is to facilitate them and help them out so they may need not help of any intruder and become self-reliant. Use of vibrators in this project is the way blind will be able to get know how and the way he will have

to go. In case of any accidental happening, blinds guardian will get to know immediately and he will be able to help him. With this system now a blind can go out of home alone too easily. The development can be more transform to extend ranges for obstructions and development in GPS technology continues to improve, accuracy will increase. Advances in mobile technology have helped to develop better continuous habitat assessment applications. Wi-Fi and the Internet of Things can also be involved, so structures such as weather and traffic forecasts can help blind people make better decisions.

REFERENCES

[1] World Health Organization, "Universal eye health: a global action plan 2014-2019"World Health Organization 2014.

[2] D. Gbenga, A. Shani and A. Adekunle, "Smart Walking Stick for Visually Impaired People Using Ultrasonic Sensors and Arduino", International Journal of Engineering and Technology, vol. 9, no. 5, pp. 3435-3447, 2017.

[3] Calder, David J,Curtin, “An obstacle signaling sytem for the blind,Digital Ecosystems and Technologies,”Confrence(DEST),2011 Proceedings of the 5 th IEEE International Confrence on 30 June 2011 .

[4] Shruti Dambgare , Prof.A.Sakhare,”Smart Stick for Blind:Obstacle Dection,Artificial Vision and Real- Time assistance via GPS” Confrence (NCICT)2011, Proceedings 2nd National Confrence on Information and Communication Technology 2011.

[5] A. Anwar, "A Smart Stick for Assisting Blind People", IOSR Journal of Computer Engineering, vol. 19, no. 3, pp. 86-90, 2017.

[6] Sandra Mau, Nik A. Melchior, Maxim Makatchev, Aaron Steinfeld, “BlindAid: An Electronic Travel Aid for the Blind” The Robotics Institute Carnegie Mellon University Pittsburgh, Pennsylvania 15213 May 2008.

[7] C. Spooner, "Visual impairment and work: experiences of visually impaired people", Disability & Society, vol. 33, no. 3, pp. 499-501, 2017.

[8] R. Khlaikhayai, C. Pavaganun, B. Mangalabruks and P. Yupapin, "An Intelligent Walking Stick for Elderly and Blind Safety Protection", Procedia Engineering, vol. 8, pp. 313-316, 2011.

[9] Mohd Helmy Wahab, Amirul A. Talib, Herdawatie A. Kadir, A.Noraziah, Roslina M. Sidek, “Smart Cane: Assistive Cane For Visually-Impaired People”,IJCSI International Journal of Computer Science Issues, Vol. 8, Issue 4, No 2, July 2011.

[10] Abdel Ilah Nour Alshbatat, “Automated Mobility And Orientation System For Blind Or Partially Sighted People”,International Journal on Smart Sensing and Intelliegent System.