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A Survey on Smart Blind Stick for Obstacle Detection

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ABSTRACT

The main drawback with blind individuals is to travel a way to their destination where they require to travel. Such individuals would like help from others with sensible sight. As represented by World Health Organization, 10 percent of the visually impaired don't have any practical sight in the least to assist them move around while seeking no help. This study proposes a new technique for designing a smart stick to help visually impaired people that will provide them obstacle free navigation. The proposed system intended to provide low cost and efficient navigation aid for the blind. It gives a sense of artificial vision by providing information about the environmental scenario of objects around them. The main concern is to help visually challenged people to navigate with ease using advance technology. Physical movement could be a challenge for visually impaired persons, because it can become tricky to distinguish where he/she is, and how to get, where he wants to go, from one place to another. In this technology-controlled world, where people strive to live independently, this project proposes an ultrasonic stick for blind people to help them gain personal independence. This paper also surveys different systems proposed by different authors which include different sensors. Each systems has its own cons and pros which make them different from each other and our proposed systems include the most efficient and effective algorithms which make it very helpful for the visually impaired people.

Keywords : Technology Controlled World, Obstacle Detection, Visually Impaired People, Concrete Wall, Human Body, Cardboard Box, Plastic

I. INTRODUCTION

Visually impaired people finds it difficult to recognize the smallest detail without healthy eyes. Survey by World Health Organization carried out in 2011 estimates that in the world, about 70 million people is visually impaired and, about 7 million people fully blind and about 63 million people with low vision. The problem with blind people is to navigate their way to wherever they want to go. People need assistance from others. As visually impaired have no functional eyesight at all to help them move around without assistance and safely. This study proposes a technique for designing a smart stick to help visually impaired people that will provide them navigation. The conventional navigation aids for persons with visual impairments are the walking cane and dogs which are characterized by many imperfections.

Shortcomings of these include: training phase, range of motion, and very insignificant information communicated been communicated. Our approach modified this cane with some electronics components and sensors, the electronic aiding devices are designed to solve such issues. The ultrasonic sensors, humdity sensor, buzzer, and vibration motor are used to record information about the presence of obstacles and water on the road. Therefore whenever there is an obstacle in its range it will alert the user by sensors. Humidity sensor is used to detect water in path of the user. Blind guidance systems use ultrasound because of its environmental noise. With modern technology both in hardware and software it has become easier to provide intelligent navigation system to the visually impaired. Much research effort have been focused on design of Electronic Travel Aids to aid successful and free navigation of the blind. Also, high-end technological solutions have been introduced recently to help blind person navigate on their own. Another reason why ultrasonic is prevalent is that the technology is cheap. Moreover, ultrasound emitters and detectors are portable components that can be carried out without the need for complex circuit.

Whenever user wants to locate it, such a person will press a button on remote control and buzzer will ring, then the person can get the idea of where the stick is placed. Vision is most important part of human physiology as information human being gets from the environment is via sight. The 2011 statistics by the World Health Organization (WHO) estimates that there are 70 million people in the world living with visual impairment, 7 million of which are blind and 63 million with low vision. The conventional aids for persons are characterized with many limitations. Some inventions require separate power supply. These bulky designs will definitely make the user to be exhausted. The objective of research: is to style a technology for visually impaired folks that observe obstacles and different routes for blind; to alarm the user through vibration to see the obstacles; and to help the user finding his stick when he cannot remember where is was kept. Several attempts have been made to design obstacle avoidance devices for the blind using components with limited number of applications. This section will discuss some of these attempts and their shortcomings. In the system, ultrasonic sensor, water sensor, Buzzer, vibrator and battery were used.

II. OBJECTIVE

The main objective is to assist visually impaired folks to navigate with ease with help of advance technology. In this technology controlled world, we are trying to help the blind people match up the pace with the normal people and do not feel left back, this project proposes associate in detecting and alarming stick for blind folks to assist them gain personal independence. Since this is economical and not bulky, one can make use of it easily.

III. LITERATURE SURVEY

The authors Ashraf Anwar and Sultan Aljahdali [12] in their paper used ultrasonic sensors and IR sensors for detecting the obstacle coming in the path of the blind person, also they have used heat and moisture sensor for giving more details to the person with the stick about the road or path. For alarming the blind person they are using different buzzers and sensors that will tell the person that something is there in front of him/her. The only disadvantage of this system is that GPS is not included in this system.

In the paper named 'Implementation and Design of Smart Blind Stick for Obstacle Detection and Navigation System' whose authors are K.S.Manikanta, T. S. S. Phani , A. Pravin [13] used GPS/GPRS in their model which helped the visually impaired person to navigate on the roads without the help of others. As moisture sensor is not included in the model so it cannot detect water present in the path of the person using that stick.

Vipul V. Nahar, Jaya L. Nikam, Poonam K. Deore [14] in their paper used moisture sensor but excluded the GPS/GPRS module which will not help the blind person to navigate on the street but it fully help in all other conditions which include detection of obstacle, water detection etc. The disadvantage of this system is that it will not be able to work in monsoon season as the moisture sensor will continuously keep beeping or vibrating which will irritate the person using it.

This paper depicts the system which include all the sensors which are not included in the previous papers including the GPS/GPRS, which can locate the geolocation of the person using it and can inform the well wishers of the blind person when in emergency. The authors of this paper are John Victor, Mayank Gupta, Manikandan [15].

The model introduced by R.Dhanuja, F. Farhana, and G.Savitha [16] is the most advanced system of blind stick till date. It includes LCD display, voice playback module and voltage regulator. The LCD display helps the peron in the real world help the blind person in emergency situation such as battery drain out, some physical fault in the stick etc. The voice playback module helps the person to navigate and tell the direction by the earpiece in the blind person ears. This is surely the best advancement for the blind stick system. Voltage regulator comes in action when voltage overflow is there in the stick and prevents any damage to the stick. The disadvantage of this stick is that the location of the blind person with the stick cannot be detected as this system is not using GPS/GPRS sensors.

Thinking out of the box, authors Manoj Kumar, Shekhar Singh, Mukesh Kumar [17] thought about the irritation caused by the vibration and buzzers installed in the blind stick. So they introduced motors which will redirect the direction of the blind stick when any obstacle comes in front of it. It is very innovative but when comes to the feasibility of the blind stick on all terrains it is not a success as motors cannot be used on every surface.

IV. PROPOSED WORK

The proposed system provide efficient navigation and low cost aid for the blind which gives a sense of artificial vision by providing them information about the environmental scenario of objects around them. Performance of prototype developed was evaluated with four obstacle scenario which are: Concrete wall, Human body, Cardboard box, and Plastic. The solution is moderate budget navigational aid for visually impaired. The cost effectiveness of the proposed solution leads to compromises in performance.

The device will be capable of detecting obstacles and moisture, by using ultrasonic sensors, arduino Uno, moisture sensors and other devices that employ audio commands to alert the user of what is on the path of movement can construct better devices. A vibrator may also be added for further ease of use and convenience. One of the downside of their planned technique is that capability of the stick is restricted as a visually impaired person will only be allowed to travel four locations with the stick. Also, the navigation system will need to convey information other than that needed for guidance, and it is not feasible to provide guidance information at high intermittencies. Improvements that will improved the proposed system: Increasing the range of the ultrasonic sensor and implementing a technology for determining the speed of approaching obstacles.

V. V. BLOCK DIAGRAM

The microcontroller then processes this knowledge and calculates if the obstacle is within the range. If the obstacle isn't in the range then the circuit will do nothing. If the obstacle is within the range of the microcontroller then it sends a symbol to sound a

buzzer. It also detects and sounds a different buzzer if it detects water within that range and alerts the blind.

Following **fig:1** is the block diagram of our proposed model depicting the input and output of the system. The input will be consisting of the sensors we are including in the model and output is the senses that can be felt by the blind person which are in the form of vibration or buzzer depending on the type of obstacle coming in front of the blind person that can be of any solid material or can be water.

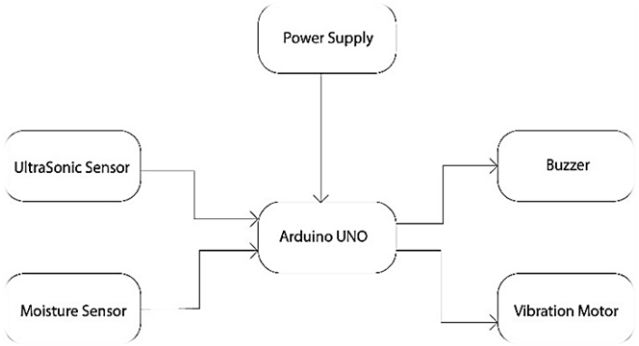

Fig-1: Block Diagram of the Proposed Model

The image shown in **fig-2** demonstrate the working of one of the sensors included in the blind stick i.e ultrasonic sensors. Ultrasonic sensors sends waves and if any obstacle comes infront of the waves the wave return back to the device and then the calculation is done and the sounds are produced accordingly to alarm the blind person.

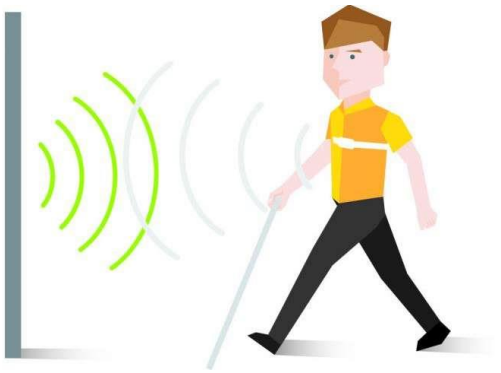

Fig-2 : Ultrasonic Sensor Working

VI. COMPARATIVE ANALYSIS OF THE SYSTEMS

S.NO.	**Paper Name/Author/ Year**	**Functionality**	**Advantages**	**Disadvantages**
1	A Smart Stick for Assisting Blind People /Ashraf Anwar, Sultan Aljahdali/2017	Arduino Uno , Ultrasonic Sensors, Heat Sensors, IR Sensors, Buzzer & Vibrator , Moisture Sensor	Able to navigate in any condition without help of others.	GPS is not involved (which is in future scope to be added), So that current position can be added.
2	Implementation and Design of Smart Blind Stick for Obstacle Detection and Navigation System /K.S. Manikanta, T.S.S. Phani, A. Pravin/2018	Ultrasonic sensor, microcontroller, Buzzer, GPS/GPRS	As they are using GPRS, they can locate or can give any information about any route.We can locate the stick itself by GPS.	As we are not adding moisture sensor, we cannot detect water in our path.
3	Smart Blind Walking Stick/Vipul V Nahar, Jaya L, Poonam K deore/2016	Ultrasonic sensor, microcontroller, Buzzer, Moisture sensor	As we are adding moisture sensor to the blind stick, stick will detect moisture in atmosphere.	We cannot use moisture in blind stick in monsoon and also we are not using GPS.

4	Smart Stick for Blind People /John Victor, Mayank Gupta, Manikandan/2017	Arduino uno, location tracking (GPS & GSM module), Ultrasonic & Vibration Motor	Helps in detecting obstacle using Ultrasonic and also help to find the geolocation with the help of GPS and GSM.	Will not be able to find potholes in poth and also not able to find water ahead.
5	SMART BLIND STICK USING ARDUINO /R.Dhanuja, F. Farhana, G.Savitha/2018	Arduino uno, ultrasonic sensor, IR sensor, voice module playback, LCD display, voltage regulator.	When accidently voltage increases the voltage regulator will come in action and LCD display and voice playback module seeks great help.	Cannot find the position of the individual and even the blind stick.
6	Ultrasonic Based Smart Blind Stick For Visually Impaired Persons /Manoj Kumar, Shekhar Singh, Mukesh Kumar/2017	Buzzer, ultrasonic sensor with motors, microcontroller and alarm	Continuous buzzer will not be there hence the irritation will be less.	Motors may not be helpful in all surfaces.

VII. CONCLUSION

The aim of this model is to style and implement a smart walking stick for the blind which will be absolutely achieved. It is expected to come up with good results in detecting the obstacles on the path of the user to a certain range. This system will be effective and affordable as well. Though the system will be hard-wired with sensors and other components, but it will be light in weight. Further aspects of this project will be improved with wireless property between the system parts, thus, increasing the range of the ultrasonic sensor and implementing a technology for determining the speed of approaching obstacles. In the future, necessary modifications will be added to enhance the performance of the system. These include: A global positioning method to find the position of the user using the GPS, and GSM modules to communicate the location to a relative or care giver. It ought to conjointly accommodate with variable grips for versatile handling.

VIII. REFERENCES

[1]. G. Gayathri, M. Vishnupriya, R. Nandhini and M. Banupriya "Smart Walking Stick for Visually Impaired." International Journal of Engineering and Computer Science, vol. 3, number 3, pp. 4057-4061, 2014.

[2]. R. Radhika, P.G. Pai, S. Rakshitha and R. Srinath"Implementation of Smart Stick for Obstacle Detection and Navigation." International Journal of Latest Research in Engineering and Technology, vol. 2, number 5, pp. 45-50, 2016.

[3]. M.H. Mahmud, R. Saha and S. Islam "Smart Walking Stick – An Electronic Approach to Assist Visually Disabled Persons." International Journal of Scientific and Engineering Research, vol. 4, number 10, pp. 111-114, 2013.

[4]. A. Jose, G. George, M.R. Nair, M. J. Shilpa and M. B.Mathai "Voice Enabled Smart Walking Stick for Visually Impaired." International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, vol.5, pp. 80-85, 2016.

[5]. C.S. Kher, Y.A. Dabhade, S.K Kadam., S.D. Dhamdhere and A.V. Deshpande "An Intelligent Walking Stick for the Blind." International Journal of Engineering Research and General Science, vol. 3, number 1, pp. 10571062, 2015.

[6]. B.G. Roopashree, B.S. Patil and B.R. Shruthi "Smart Electronic Stick for Visually Impaired." International Journal of Innovative Research in Science, Engineering and Technology, vol. 4, number 7, pp. 6389-6395, 2015.

[7]. O. O. Olakanmi, "A Multidimensional Walking Aid for Visually Impaired Using Ultrasonic Sensors Network with Voice Guidance", International Journal of Intelligent Systems and Applications (IJISA), vol. 6, number 8, pp. 53-59, 2014. DOI: 10.5815/ijisa.2014.08.06

[8]. E. J. Chukwunazo and G. M. Onengiye "Design andImplementation of Microcontroller Based Mobility Aid for Visually Impaired People." International Journal of Science and Research. Vol. 5, issue 6, pp. 680-686, 2015. Available at http://dx.doi.org/10.21275/v5i6.NOV164233.

[9]. G. Prasanthi and P. Tejaswitha "Sensor Assisted Stick for the Blind People." Transactions on Engineering and Sciences, vol. 3, number 1, pp. 12-16, 2015.

[10]. Ashraf Anwar, Sultan Aljahdali "A Smart Stick for Assisting Blind People" IOSR Journal of Computer Engineering (IOSR-JCE) Volume 19, Issue 3, Ver. II (May.-June. 2017).

[11]. K.S.Manikanta , T. S. S. Phani, A .Pravin "Implementation and Design of Smart Blind Stick for Obstacle Detection and Navigation System" Volume 8 Issue No.8.

[12]. Vipul V. Nahar, Jaya L. Nikam, Poonam K. Deore "Smart Blind Walking Stick".

[13]. Manikandan Shanmugam, John Victor, Mayank Gupta and K. Saravanakumar, "Smart Stick for Blind People" International Journal of Trend in Research and Development (IJTRD).

[14]. Manoj kumar, Rohit verma, Mukesh kumar, Shekhar Singh, Er. Thakurendra Singh "Ultrasonic Based Smart Blind Stick For Visually Impaired Persons" International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering Vol. 6, Issue 3, March 2017.

[15]. R.Dhanuja, F.Farhana, G.Savitha "SMART BLIND STICK USING ARDUINO" International Research Journal of Engineering and Technology (IRJET) Volume: 05 Issue: 03 | Mar-2018.

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