A Smart Voice-Enabled Blind Stick For Visually Impaired People

Nisha M R[1], Mr. I. Siva Prasad Manivannan M.E [2]
[1, 2] Dept of CSE
[1, 2] Rohini College of Engineering and Technology

Abstract- *Visually impaired people face a challenge when it comes to navigating safely from place to place. It becomes increasingly difficult for them to perform trivial tasks without heavily depending on others. Our proposed system aims to provide an efficient way to remedy this issue. The smart stick is a technique to help sightless people to recognize their way. To accomplish this, the system involves many sensors to screen fundamental signs that can be interfaced to the relative mobile or the web. The gadget will exchange the readings from the sensor to cloud remotely and the information gathered will be accessible for analysis progressively. It has the capacity of reading and transmitting emergency signs to relatives. In this webcam take pictures of the scene and afterwards pre-process these pictures with the help of Viola Jones and Tensor Flow Object Detection algorithm. The said techniques are used to detect objects. The Internet of Things (IoT) is a newly emerging term for the new generation of the Internet which allows understanding between interconnected devices. IoT acts as an assistant in healthcare and plays an extremely important role in wide scopes of medicinal services observing applications.*

Keywords- Smart system, visual losses, biomedical sensor, object recognition, tensor flow, Viola Jones, ultrasonic sensor..

I. INTRODUCTION

Each typical person sees, tunes in and after that responds to the circumstances by talking himself out. Individuals, fundamentally the hard of hearing and the imbecilic, depend on some kind of gesture based communication for imparting their emotions to others. For the most part idiotic individuals utilize gesture based communication for correspondence, yet they discover trouble in speaking with other people who don't comprehend communication via gestures. Thus, there is a boundary in correspondence between these two groups. This venture intends to lower this obstruction in correspondence.

It turns into the issue for two people who knows two diverse dialects, so it turns into an issue to chat with each other thus they require an interpreter physically which may not be constantly helpful to orchestrate and this same sort of issue happens in the middle of the Normal Person and the Deaf individual or the Normal Person and the Dumb individual. The fundamental point of the venture is to build up a financially savvy framework which can offer voice to voiceless. With the proposed work is signalled are changed over into discourse. It implies that correspondence boundary between two unique groups can be made productive.

Blindness means the inability of visual perception due to physiological or neurological factors. Many blind people have trouble maintaining a proper circadian rhythm due to the lack of visual input to their brains. In one's life navigating from one place to another is one of the most important and fundamental functions. Visually challenged people face this problem on a day to day basis. Many blind people are dependent on others for navigation.

To be categorized as blind, there is a total loss of vision. Blindness cannot be corrected by simple visual aids such as glasses. For the indigents blindness is a drawback. So this paper puts forward a system to aid the visually challenged. The Assistor is a device which is a passive type intelligent stick that focuses on aiding the visually challenged people to move around from one place to another without having to worry about anything.

The Assistor is a smart walking stick that has two types of input sensors: ultrasonic sensors and image sensors, which continuously feeds information to the smart phone. The ultrasonic sensors are used to detect how far the objects are from the person and the image sensor finds what those objects are with precision. The data from the sensors are transmitted to the Smartphone through Bluetooth communication. A servo motor is used for the mobility of the stick. A microcontroller is used to interface the hardware components with the smart phone.

The entire project is dependent on the Smartphone App and its reliability. It performs all the computation and calculations. A separate database is designed, where the definition of the objects are found. In the system level we could say that the novelty lies in the real-time application

working on the Smartphone. The power of vision is one of the most significant parts of human physiology. Our eyes are the key to our surroundings. Unfortunately, approx 285 million people are estimated to be visually impaired worldwide, of which 39 million are blind, according to a report published by the World Health Organization (WHO).82% of blind people are of the age of 50 and above. Moreover, 90% of visually impaired people belong to the developing countries. The earliest form of navigation tool for the blind has been in the form of a walking stick. But the drawbacks of using it are the lack of necessary skills, Cost and training period. With the advances in technology, it has become possible to design and develop technological solutions that can help a visually impaired person to navigate freely. Various research works have been carried out for developing such smart blind stick. A navigation tool was developed that uses GPS, voice module and an ultrasonic sensor for obstacle detection. It guides the person using the stick by providing directions. It uses an ARM processor which contains more memory and has a high operating speed. But, this system cannot be used indoors since there will be no GPS detection. Another proposes a navigation tool using proximity sensors, ultrasonic sensors, GPS module, stereo cameras and dual feedback system- auditory as well as vibratory circuit.

II. LITERATURE SURVEY

The objective of this paper is used to help the blind people and they are able to easily interact with the physical world by using this smart blind stick. About 285 million people are visually impaired worldwide: 39 million are blind and 246 million have low vision. If you notice them, you can very well know about it they can't walk without the help of other. One has to ask guidance to reach their destination. Using this blind stick , a person can walk more confidently. This stick with ultrasonic sensor detects the object in front of the person and give response to the user by alarm from the buzzer. So, the person can walk without any fear. The another LDR sensor are used in the stick to identify the day and night for the blind people. The microcontroller to receive the sensor signals and process them to short pulses to the Arduino pins where buzzers are connected. This device will be best solution to overcome their difficulties and help them to live the better life.

Blind person finds it difficult to detect the presence of any obstacles in their way while moving from one place to another and it is very difficult to find the exact location of the stick if it have been misplaced. Thus, the smart stick comes as a proposed solution to help the visually impaired people in their day to day living without the help of others. In this paper we proposed a solution for the blind people by using an ultrasonic sensor in the blind stick. The instrument stands used to perceive the obstacles at the range of four meters and infrared instrument is castoff to perceive the nearer complications in front of the blind people. Thus the radio frequency transmitter and receiver help the user to find the exact location of the smart stick with the help of buzzer. The vibration motor which is placed in the smart stick gets activated and produces a vibration when any obstacle is detected. This proposed method uses the Arduino UNO as controller. The branch is accomplished of sensing all difficulties in front of the user. The smart stick is of user friendly, quick response, very low power consumption, lighter weight and it is easy to hold and fold by the user.

Independence is the building methodology in achieving dreams, goals and objectives in life. Visually impaired persons find themselves challenging to go out independently. There are millions of visually impaired or blind people in this world who are always in need of helping hands. For many years the white cane became a well-known attribute to blind person's navigation and later efforts have been made to improve the cane by adding remote sensor. Blind people have big problem when they walk on the street or stairs using white cane, but they have sharp haptic sensitivity. The electronic walking stick will help the blind person by providing more convenient means of life. The main aim of this paper is to contribute our knowledge and services to the people of blind and disable society.

Visual impairment and blindness in people is a factor that greatly reduces mobility among them .With the recent advances in technology it is possible to extend the support given to people with visual impairment and blindness during their mobility This paper proposes a new view about biometric instrument for blind peoples to sense and detect obstacles. A device is designed so that the blind people will be able to walk without any white cane. The aim of this paper is to provide an obstacle identifier to blind persons, so that they can able to cross through the obstacles easily without their walking stick. They are provided with spectacles to wear on, which are embedded with ultrasonic distance measurement scale equipment and a camera with a headphone. The proposed device is based upon the target finding using ultrasonic sound. The camera in the device helps to identify the person and to re- call from the individual's memory, when the person re-appears before him. The advantage of this paper is that the device proposed need not be carried with pain. The proposed device will be more users friendly. The accuracy level of identifying the target is also improved.

Blind people need some aid to feel safe while moving. Smart stick comes as a proposed solution to improve the

mobility of both blind and visually impaired people. Stick solution use different technologies like ultrasonic, infrared and laser but they still have drawbacks. In this paper we propose, light weight, cheap, user friendly, fast response and low power consumption, smart stick based on infrared technology. A pair of infrared sensors can detect stair-cases and other obstacles presence in the user path, within a range of two meters. The experimental results achieve good accuracy and the stick is able to detect all of obstacles.

III. PROPOSED SYSTEM

The main aim is to done to find ways to improve life for visually challenged people. The smart walking stick, the Assistor, helps visually challenged people to identify obstacles and provide assistance to reach their destination. The Assistor works based on the technology of object detection. The design of the Autonomous Walking Stick for the Blind Using Ultrasonic sensor detection and mailing system involves the incorporation of the following steps.

Ultrasonic sensors are incorporated- to sense objects on the right, left and in front respectively. Water level sensor is used to sense the water level in the particular path area can be detect. Mems sensor is used for find path variation. Pulse sensor is used for monitoring the pulse variation of the user. Temperature sensor used for monitoring the body temperature of the user. GPS is used to track the location and give to tracking details messaging to the mobile with the help of wi-fi module. The Arduino microcontroller has to be programmed in order to calculate the distance of any object from the sensor. The programming of the microcontroller is done in C language with the using of proteus design. The sensor information's given to the controller. The voice module is used for getting voice output.

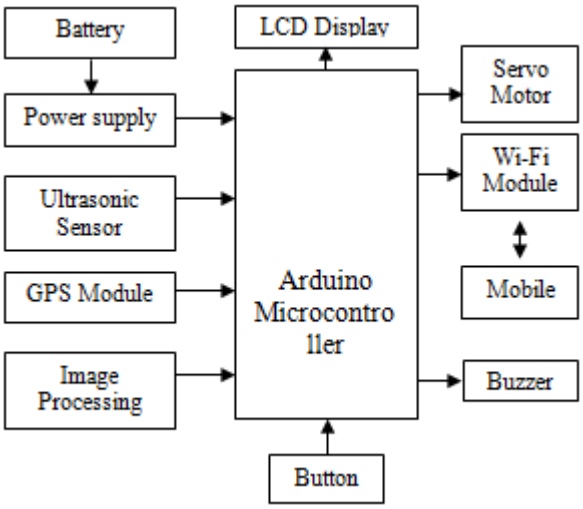


Fig 1.1 System Architecture

The working behind this blind stick is that it is used for special purpose as a sensing device for the blind people. The circuit provides 5V power supply for the circuit and maintains its output of the power supply at constant level. If any object is present, the ultrasonic sensor detects the object by measuring the distance between the object and the user and sends the data to the arduino UNO. To determine the distance of an object, calculate the distance between sending the signal and receiving back the signal. The main advantage of the system is that it helps the blind people in both indoor and outdoor, care-free navigation. The devices placed in the stick makes it comfortable and easy to handle. The smart stick helps in detecting obstacles placed at a distance in front of the user.

Modules Block Diagram

Arduino Microcontroller

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino senses the environment by receiving inputs from many sensors, and affects its surroundings by controlling lights, motors, and other actuators. Writing codes in the Arduino programming language and using the Arduino development environment. Arduino consists of both a physical programmable circuit board and a piece of software, or IDE (Integrated Development Environment) that runs on computer, used to write and upload computer code to the physical board. Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. Simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. A typical ARDUINO UNO board can be used for many applications based on the coded program.

Power Supply

The circuit is powered by a 12V dc adapter, which is given to LM7805 voltage regulator by means of a forward voltage protection diode and is decoupled by means of a 0.1 uf capacitor. The voltage regulator gives an output of exactly 5V dc supply. The 5V dc supply is given to all the components including the Microcontroller, the serial port, and the IR transmitters and sensors. The AC supply which when fed to the step down transformer is leveled down to 12 volts AC. This is then fed to full wave rectifier which converts it in to 12 volts DC. This is then passed to a filter to remove the ripples. Then it is fed to a voltage regulator that converts 12 V to 5 V stable voltages and currents. Regulated power supply is an electronic circuit that is designed to provide a constant dc

voltage of predetermined value across load terminals irrespective of ac mains fluctuations or load variations.

LCD Display

LCD (liquid crystal display) is the technology used for displays in notebook and other smaller computers. Like light-emitting diode (LED) and gas-plasma technologies, LCDs allow displays to be much thinner than cathode ray tube (CRT) technology. LCDs consume much less power than LED and gas-display displays because they work on the principle of blocking light rather than emitting it. A liquid-crystal display (LCD) is a flatpanel display. Liquid crystals usually do not emit the light signal directly, instead using a backlight or reflector to produce images in color or monochrome. LCDs are available to display arbitrary or fixed images with low information content, which can be displayed, as in a digital clock.

Ultrasonic Sensor

Ultrasonic sensor provides an easy method of distance measurement. This sensor is perfect for any number of applications that require, we to perform measurements between moving or stationary objects. Interfacing to a microcontroller is a snap. A single I/O pin is used to trigger an ultrasonic burst well above human hearing and then listen for the echo return pulse. The sensor measures the time required for the echo return, and returns this value to the microcontroller as a variable-width pulse via the same I/O pin. Ultrasonic sensors are often called transducers. The function of the transducers is to convert electrical energy into mechanical energy which directly corresponds to ultrasonic vibration, and vice versa. The most common way of generating and detecting ultrasonic waves utilizes the piezoelectric effect of a certain crystalline material such as quartz. Since the piezoelectric effect is reciprocal, it produces a deformation a mechanical stress in a piezoelectric material when an electrical voltage is applied across the material, and conversely, it produces an electrical voltage when a deformation a mechanical stress is applied to the material.

Wi-Fi Module

The ESP8266 Wi-Fi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much Wi-Fi-ability as a Wi-Fi Shield offers. The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community.

MODULE DESCRIPTION

User

Many people have some type of visual problem at some point in their lives. Some can no longer see objects far away. Others have problems reading small print. These types of conditions are often easily treated with eyeglasses or contact lenses. But when one or more parts of the eye or brain that are needed to process images become diseased or damaged, severe or total loss of vision can occur. In these cases, vision can't be fully restored with medical treatment, surgery, or corrective lenses like glasses or contacts. People rarely lose their eyesight during their teen years. When they do, it's usually caused by an injury like getting hit in the eye or head with a baseball or having an automobile or motorcycle accident. This Smart stick will have an Ultrasonic sensor to sense distance from any obstacle. All the feedbacks will be given to the blind man through a Buzzer.

Object detection

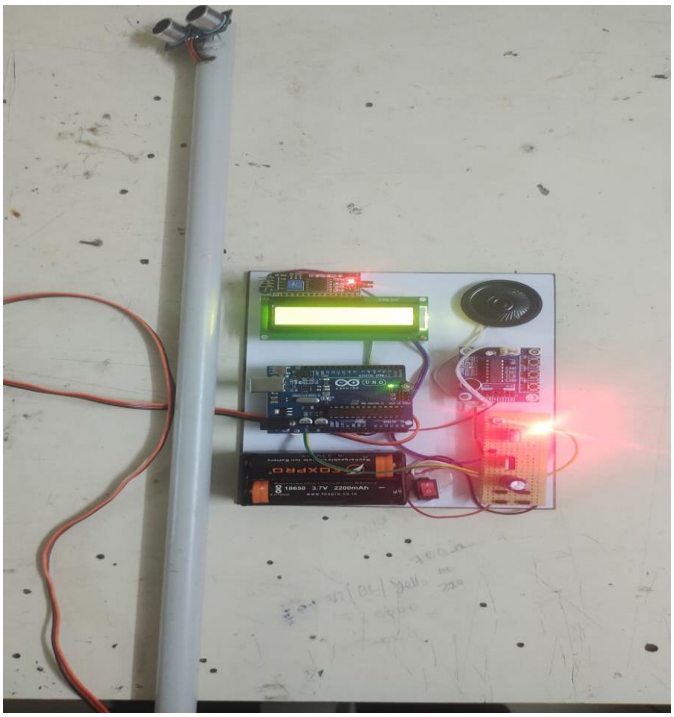
In object detection with blind people camera views, there can be an unknown number of objects (e.g., pedestrians, cars, traffic signs), and each has 4 location information defining its boundary. Moreover, the number of objects in a scene cannot be quantified easily, as each object cannot be detected in each Bayesian inference. The MC dropout-based uncertainty quantification method makes multiple predictions with randomly dropped neurons from the same model. In a highly certain model of having low epistemic uncertainty, the distances between multiple predictions should be very close. Ideally, all the predictions should be exactly at the same points. Moreover, there can be a different number of object predictions (e.g. several cars, pedestrians) in each MC prediction for a single camera view. Therefore, the MC dropout based model can produce predictions with different locations for each object in a single image.

Emergency alarm user tracking

The hardware consists of water sensor used for the detecting of water in front of the blind person. In this hardware it consists of buzzers. 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 Wi-Fi module is used the share the location to the particular mobile number.

IV. RESULTS AND DISCUSSION



V. CONCLUSION

Thus, the smart walking stick, the Assistor, helps visually challenged people to identify obstacles and provide assistance to reach their destination. The Assistor works based on the technology of echolocation, image processing and a navigation system. The Assistor may serve as a potential aid for people with visual disabilities and hence improves their quality of life. There is a lot of work and research being done to find ways to improve life for visually challenged people. There are multiple walking sticks and systems which help the user to move around, indoor and outdoor locations but none of them provide runtime autonomous navigation along with object detection and identification alerts. The Assistor uses ultrasonic sensors to echo sound waves and detect objects. Smartphone app is used to navigate the user to the destination using GPS (Global Positioning System) and provide the latitude and longitude map regions. The Blind Walking Stick has been finally made into prototype which can be used to guide the blind. Its aim is to solve the problems faced by the blind people in their daily life. The system also takes the measure to ensure their safety. This project will operate to help all the blind people in the world to make them easier to walk everywhere they want. It was done to help the blind to move infront very well. It is used to help the people with disabilities that are blind to facilitate the movement and increase safety.

A variety of future scope are available that can be used of with the stick such as text-to-speech system and embed it with the mobile. So that blind person can actually hear the directions in form of voice. In this way, the user can connect with the family and loved ones by sharing the precise location, through mobile. This can also be helpful if the visually impaired person loses the specific route that has to be followed. For connecting the text-to-speech system with the cell phone, the user can use a paid application like the KNFB reader

REFERENCES

[1] Adarsh S, Mohamed Kaleemuddin S, Dinesh Bose and K I Ramachandran, (2016)“Performance comparison of Infrared and Ultrasonic sensors for obstacles of different materials in vehicle/ robot navigation applications”, IOP Conf. Ser.: Mater. Sci. Eng. 149 012141.

[2] Balakrishnan, G. Sainarayanan, G. Nagarajan, R. and Yaacob, S.(2007) Wearable RealTime Stereo Vision for the VisuallyImpaired, Engineering Letters, vol. 14, no. 2.

[3] Chaurasia, Shashank Kavitha, K.V.N.. (2015), ”An electronic walking stick for blinds”. 2014 International Conference on Information Communication and Embedded Systems, ICICES 2014. 10.1109/ICI-CES.2014.7033988.

[4] Dey, N. Paul, A. Ghosh, P. Mukherjee, C. R. De and S. Dey,(2018) ”Ultrasonic Sensor Based Smart Blind Stick,” 2018 International Conference on Current Trends towards Converging Technologies (ICCTCT), Coimbatore, pp. 1-4, doi: 10.1109/ICCTCT.2018.8551067.

[5] Diana Earshia, S.M.Kalaivanan and K.Bala Subramanian. “A Wearable Ultrasonic Obstacle Sensor for Aiding Visually Impaired and Blind Individuals”, International Journal of Computer Applications® (IJCA) (0975 – 8887) National Conference on Growth of Technologies in Electronics, Telecom and Computers - India’s Perception, GOTETC-IP’13.

[6] Docbelle W. (2000) Artificial Vision for the blind by Connecting a Television Camera to the Brain, ASAIO Journal, Vol:46, page 3-9.

[7] Dodds, A. Clark-Carter, D. and Howarth, C. (1984)The sonic PathFinder: an evaluation, Journal of Visual Impairment and Blindness, vol. 78, no. 5, pp. 206–207.

[8] Duraisamy Sathya & Pugalendhi Ganesh Kumar,(2017) ‘Secured Remote Health Monitoring System, IET

Healthcare Technology Letters', vol. 4, issue. 6, pp. 228-232.

[9] Kuranov, R. L. A. and Pisarevsky, V.(2002) An empirical analysis of boosting algorithms for rapid objects with an extended set of Haarlike features, Intel Technical Report MRLTR-July 02-01.

[10] Lienhart, R. and Maydt, J.(2002) An extended set of Haar-like features for rapid object detection, presented at the IEEE International Conference on Image Processing.

[11] Manikandan Shanmugam, John Victor, Mayank Gupta and Sara- vanakumar, K. (2017) "Smart Stick for Blind People", National Conference On Emerging Trends In Information Technology (EIT-17) Organized By Department Of Computer Science, Christ University, Bengaluru.

[12] Nada A. A., Fakhr M. A. and Seddik. A. F.,(2015) "Assistive infrared sensor based smart stick for blind people," 2015 Science and Information Conference (SAI), London, pp. 1149-1154, doi:10.1109/SAI.2015.7237289.

[13] Osama Bader AL-Barrm (2012)International Journal of Latest Trends in Engineering and Technology(IJLTETJ) Smart Cane Assisted Mobility for the Visually Impaired, World Academy of Science, Engineering and technology International Journal and Information Engineering Vol:6 No:10,

[14] Prasanthi, G. and Tejaswidho, P. (2015) Sensor assisted Stick for the Blind People-Transmission on Engineering and Sciences, vol:3,number 1, pp-, 12-16.

[15] Satam, A. Ihab Al-Hamadani, Mokhaled Ahmed, Alaa. (2019). Design and Implement A Smart Blind Stick. Journal of Advanced Research in Dynamical and Control Systems. 11. 42-47.

[16] Shovel, S. Borenstein, J. Koren, Y.(1998) Auditory guidance with the Navbelt-a computerized travel aid for the blind, IEEE Tr. SMC, Vol.28.

[17] Ulrich, I . Borenstein, J.(2001) The GuideCane –Applying Mobile Robot Technologies to Assist the visually impaired, IEEE Tr.SMC, Vol:31, No.2, March.

[18] van Erp, J.B.F. Veltman, J.A. van Veen H.A.H.C. (2003): A Tactile Cockpit Instrument to support Altitude Control, Proceedings Human Factors and Ergonomic Society 47tn annual meeting.