IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

ULTRASONIC SIGHT

AID FOR VISUALLY CHALLENGED PEOPLE

[1]Abarna M, [2]Jane Lourde Teresha A, [3]Devisri R, [4]Maithreyini M, [5]Dr.V.Kumar Chinnaiyan

[1,2,3,4] Final Year Electrical and Electronics Engineering, [5] Professor and Head/EEE

[1]Department of Electrical and Electronics Engineering,

[1]KPR Institute of Engineering and Technology, Coimbatore, India.

Abstract: Humanity grows as technology grows. Growth is complete only when it is uniform and common. In places where growth is uneven, technology steps in and happens to be the game changer. Ours is one such project that is aimed at bringing uniformity in the navigation of visually challenged people just like the common people. The project aims to support the safe navigation of people with low vision. This helps the individual in reaching the destination, guiding them throughout the way and warning them about the obstacles that are awaiting their way through vibration and synthetic speech output by means of a headset. Thus, preventing them from colliding with the obstacles. This adds on value to the conventional cane that has been used since ages. It makes use of an ultrasonic sensor to calculate the distance from the obstacle, a Raspberry Pi upon which the operational program and all the other components are based, a vibration motor to alert the person. Along with the function of guiding, it also has a backup protection plan in case of emergency. Wherein an alert message containing his location is sent to the person's predetermined friend through Blynk app with the help of GPS and GSM which is enabled through emergency button, thereby preventing any further complications. A pulse sensor is also used to have a basic monitoring of the person's pulse rate. Thus, the project assures the visually challenged people to move around alone safely as well as confidently without the fear of getting lost or meeting with accidents anymore.

Index Terms **- Visually challenged, vibration motor, image processing, object detection.**

I. INTRODUCTION

Success is not an accident; it is a continuous process which involves the coordination of sound body and mind. A sound body is inevitable to endure any task. If health is lost everything is lost, we are in the urgent need to turn our attention towards health and health related stuffs. For someone with normal health conditions, things are comparatively easy to people who are physically challenged. They face various social, physical and mental threats. They are always put under a situation where they are dependent on others for carrying out their routines. The world is undergoing an enormous growth in terms of science and technology. We read about numerous technologies every day. There are inventions that are in the embryonic stage waiting to surprise the next generation with unbelievable advancements to help the needy ones. Yet on the other side we see people are now more prone to various kinds of diseases and difficulties. Especially visually impaired people face more problems. It is estimated that 28.5 crore individuals are visually impaired across the globe, 3.9 crore belong to the complete vision lost category and 24.6 crore have minimal eyesight across the planet. As emerging technology have given many solutions for blind people, it hasn't achieved at its efficient level.

Around 9 out of 10 of poor vision people live in the poverty-stricken class. People more than 50 years of age and above fill about 82% of people with vision issues. They are facing many troubles throughout their lifetime. Fear of getting lost or confused in the street is the major problem. In order to reduce their difficulty level and dependency level, we proposed a system "Ultrasonic Sight", which will fulfil the basic requirements of visually impaired people. The main focus of the proposed system is to develop an aid that simplifies the travel of people with this problem. It is a Raspberry Pi based platform that is used to alert the person of the impending obstacles. It is a portable device that makes use of raspberry pi in order to find exactly what object is present and caution about the same to the user through the headset. On the other hand, so as to cut back navigation struggles of the people lacking perception. Devices like ultrasonic sensor and vibrating motors are used to find and caution respectively. It is just like a stereoscopic Sonar which is a technique used for sound propagation to navigate, communicate, with or detect object and its send back vibro-tactile feedback. In addition to this, in case of any emergency relating to the person's health or physical location, a small push button is provided on the system which when pressed sends an alert message along with the person's location to his/her friends and relatives who are predetermined. An app is created to perform this function which transfers the emergency message through the Raspberry Pi, Its GPS and a GSM. The projects aids in the independent navigation of the visually challenged person along with a backup protection that calls for the help of the person's acquaintances during emergency situations due to tensed surrounding, and health issues. Thereby, the proposed system Ultrasonic Sight ensures a prominent solution in the domain considering the visually challenged, elderly people who lack proper eyesight and also in the healthcare sectors, making world a better place to live in.

II. PROBLEM STATEMENT

Although, the technology has developed to a greater extent the devices supporting the visually impaired people hasn't developed to help the people living in average lifestyles. Still research is going on to get the supporting devices that can be afforded by everyone. The devices for the people with low vision are costly and the average living people can't afford such devices. So, we planned to create an affordable and efficient device with advancements in guiding in their way. There are lot of difficulties faced by the visually challenged people in carrying out their routine works especially while travelling alone. In this fast-moving world and increasing traffic, there are numerous possibilities of them meeting with accidents or colliding with the impedances present on their way. In this work the conventional cane used for guidance is replaced by a device that alerts the person of the impending obstacles by means of vibration and voice output of obstacles present before. In case of emergency where the person is being blocked on all the sides an immediate message is sent to the relatives or friends who are connected by the blynk app when the emergency button is pressed. The projects aids in the independent navigation of the visually challenged person along with a backup protection that calls for the help of the person's acquaintances during emergency situations due to tensed surroundings, and health issues.

III. RESEARCH METHODOLOGY

The methodology of the ultrasonic sight is explained well in the following headings. Initially the existing systems are explained with their way of helping blind people and improvements that can be added to make it as a full pack of supportive system for people in need.

3.1 EXISTING SYSTEMS

The existing system are good supporting devices for blind people but they are not effective in the way of giving full support to visually challenged people. Some of the existing systems, [1] People having eyesight troubles will find it difficult while walking alone on the roads to identify what object is present in front of them. This may lead to big complications. The smart stick uses infrared sensor to identify staircases and two ultrasonic sensors to locate any other thing placed before the user. Warning messages are given and vibration motor is also put to work by the microprocessors when an impedance is found on the path. [2] The conventional walking cane has been replaced by this walking stick. It uses Arduino UNO, voice playback module, LCD display, voltage regulator and the same two sensors. Calculations are done quickly, accurately and efficiently by using the Arduino UNO. The distance between the obstacle and the stick should be measured and this job is done by ultrasonic sensor. For detecting objects in the left and right side, infrared sensor can be used which is of small range. The reason for substituting IR sensor is to reduce the calculation difficulties that is encountered while using too many ultrasonic sensors. The person can reach the destination through the help of voice playback. [3] The ultrasonic haptic vision system uses ultrasonic rangefinder. This sixth sensory system in order to enable the person to move around the hallways and interacts with the body in an intuitive and user-places even without sight in a friendly manner and enables the user to move around without vision. [4] An Arduino Nano based obstacle finding stick for visually impaired people, which helps a blind person by detecting the obstacles using Ultrasonic sensors and android mobile application. It can inform the blind person about the circumstances & present condition of the path where he/she is walking. [5] The electronic stick like guide is used by the blind user. A switch that can be operated with the thumb that allows the blind user to send a general message on a saved mobile number for help.

3.2 PROPOSED SYSTEM

The system put forth aims at providing guidance to the visually impaired. **Figure 1 describes the proposed systems block diagram** where various components used to perform different vital roles in order to complete this guiding process. The use of ultrasonic sensor which plays the major role of detecting the distance between the object and the person. Whereas the other important function of using ultrasonic sensor is to performs the basic function of identifying any obstacle present on their way. The signals from the sensor are supplied to the Raspberry Pi, which in turn makes the vibrating motor to vibrate based on the distance from the obstacle according to the program that is fed into the Raspberry Pi.

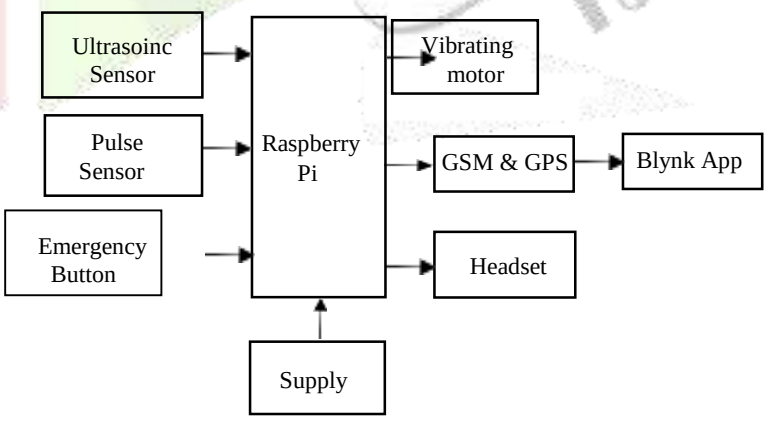

Fig.1 Block diagram of Ultrasonic Sight

The supply to the entire system is provided with the help of light weight power bank. This can be charged and reused like mobile phones, rechargeable lights etc. A prerecorded voice output through the headset is used to let them know about the obstacles that are present on their way where object is detected by image processing. Image processing is the process of performing some mathematical functions and operations on an image, images or video. The output that we get after image processing is a set of parameters or some altered images or videos. Due to the low price of the Raspberry Pi, it is being used for image processing and video processing. Already a predefined set of general objects images are stored in the Raspberry Pi memory. This is used to compare the result from camera and determines the upcoming obstacles. The speech output is made even more specific with the use of raspberry pi which identifies what exact object is present and it is let them known through the headset.

Mishaps can happen anytime and that is why we call those which happen suddenly as emergency cases. It is always good to keep some room for support at emergency cases. Here we have one such feature. In case of any emergency situation, there is a backup protection provided

which makes this system even more reliable. When the person is caught in heavily crowded places or blocked or feels like he needs some human assistance a button is placed in the system which when pressed, sends his location to the friends or relatives chosen. This specific feature is achieved by the use of GSM and GPS. The alert message is to the Blynk app which is already installed in the user/visually challenged peoples emergency contact list members.

3.2.1 Ultrasonic Sensor

Ultrasonic sensors function in such a way that it calculates the distance between the obstacle and itself. It performs this function through the use of ultrasonic waves. The ultrasonic waves are those whose frequencies will range above 20,000 Hertz. Bats use this technique for the navigation as they are nocturnal and light source cannot be possibly used. The same principle is employed in these sensors where in here they help in the navigation of the visually challenged. It measures the distance between the obstacle present on their pathway and the individual. This is same as the working of a stereoscopic sonar that is used to measure the depth of objects undersea.

Fig. 2 Ultrasonic Sensor

Figure 2 describes the ultrasonic sensor which works with the simple speed formula as in Eq (1), the distance is calculated using the below formulae for which the Speed and time must be known. Ultrasonic wave has a unique universal speed of 330m/s at room conditions and the circuitry inbuilt on the module will calculate the time taken for the US wave which is reflected back from object and turns on the echo pin high. Then the distance is calculated using a microcontroller or microprocessor.

$$Distance = Speed \times Time \qquad (1)$$

3.2.2 Vibration Motor

Vibration motors came into existence around the 1960s. The reason they were invented was because people at that time wanted vibra- call in their phones. Pan cake vibration motors are the most commonly used ones as they are economical, convenient and smaller in size.

Fig. 3 Vibration Motor

Figure 3 describes the vibration motor which are easy to be fitted into any system as they lack external moving parts. They also possess adhesive support in order to be easily attached to any surface. They possess internal H-circuitry. Here it is present in order to caution the individual incase if the ultrasonic sensor has detected an obstacle within a particular distance.

3.2.3 Global Positioning Systems

Here GPS issued in order to find the location of the individual so that it can be sent as a message to the user's predetermined friends when the person is caught in any emergency situations.

Fig. 4 GPS

Figure 4 describes the GPS which works on the principle of trilateration. It determines the position from the distance measurements to the satellites. It communicates with the satellites at the speed of light and finally ends up calculating the distance between those satellites and the device. Thus, the exact position is obtained.

3.2.4 Raspberry Pi

Raspberry pi has many advantages like it is low cost but still works as a computer. The size is just like a credit card and so it is portable. It makes work simple and forms an easy platform in learning various computer languages.

Fig. 5 Raspberry Pi

Figure 5 describes the Raspberry Pi model 3B which is the third generation raspberry Pi. It has a 40 pin GPIO with USB port, audio port etc., It can be connected to computer monitor or TV as well. An SD card inserted in the raspberry pi could work like a hard drive. Here raspberry pi is mainly used in order to find out exactly what sort of object is present based on the image from the camera. It delivers the information via a headset to the user.

3.2.5 Image Processing

The image processing is a long process which is simply explained with 5 divisions. They are

- Visualization - Observe the objects that are visible.
- Image sharpening and restoration - To create a better image.
- Image retrieval - Seek for the image of interest.
- Measurement of pattern – Measures various objects in an image.
- Image Recognition – Distinguish the objects in an image.

Initially the camera captures the image, the image processing is done and the output is given to text to speech synthesizer. Then the speech output is given to user through the headset.

3.2.6 Blynk App

Blynk app is a platform with IOS and Android apps to control Raspberry pi and Node MCU likes over the internet. It is a graphical interface for the projects by simply dragging and dropping widgets and also helps to create a project dashboard and arrange buttons, sliders, graphs on to the screen. Blynk is an open source JAVA server helps in forwarding the messages linking with the blynk mobile applications and various control boards.

Here the app is build in the name of “BLINDO”, having the feature of showing heartbeat i.e. pulse rate and notification messages etc.

IV. RESULTS

4.1 Result of Blynk App

Fig.10 shows the heartbeat rate of the user

Figure 10 describes the pulse rate of the user and shows the result in users emergency contact members phone app. This will be helpful in ensuring that the user is safe and not tensed or not in a emergency health condition.

4.2 Result of Object Detection

Fig.11 Object detection output

Figure 11 describes the object present in the path of blind user, which is then changed from text to speech and assist the visually challenged people in their way.

4.3 Result of Emergency Notification

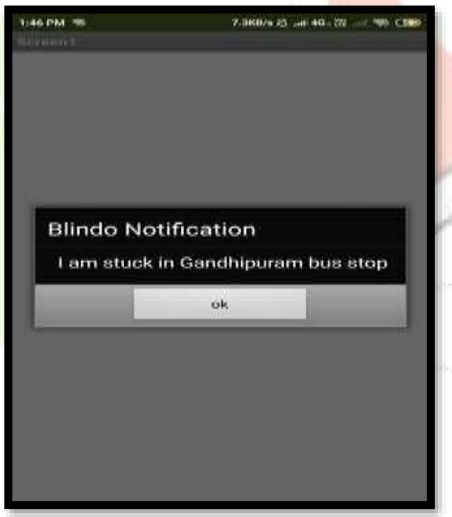

Fig.12 The alert message that has been sent to the user's predetermined friends

Figure 12 describes the alert message which is sent to the user's emergency contact list members. The alert message displays the place where the people got stuck and sends the link of exact location of the blind people.

IV. ACKNOWLEDGMENT

We are grateful to Dr.V.KUMAR CHINNAIYAN, M.E., Ph.D., Professor, Head of the Department, Department of Electrical and Electronics Engineering – KPRIET, the project supervisor for his timely suggestions and constant encouragement and support that led to the accomplishment of the project. The acknowledgement would be incomplete without a word of thanks to all our parents, faculty members and friends for their continuous support and sincere help throughout our project.

VI. FUTURE SCOPE

In the modern world everyone needs their own space of comfort; this is also applicable for the physically challenged. The wall that has been built between a normal person and an especially abled person is notable, which can be reduced or even removed. This can be fulfilled with the help of technology. Our project will help the visually impaired people to confidently travel alone without the fear of getting lost or meeting with accidents. The future scope is of reducing the systems size and make it more portable. The additional

features like guiding maps, finding known people in a particular distance, remembering the already visited places, finding shortcuts can also be included to make them as a whole individualistic traveler.

REFERENCES

[1] Ayat Nada, Mahmoud Fakhr, Ahmed FaragSeddik, "Effective Fast Response Smart Stick for Blind People", in ResearchGate conference on April 2015.

[2] R.Dhanuja, F.Farhana, G.Savitha, "Smart Blind Stick Using Arduino", in International Research Journal of Engineering and Technology (IRJET) on Volume 5 issued on 03 | Mar-2018.

[3] Sager Pangavhane, SopanPatil, Vishal More, Pallav Kulkarni, "Ultrasonic Haptic Vision", in International Journal of Advanced Research in Computer and Communication Engineering in vol. 5, issue 3, March 2016.

[4] Nadia Nowshin, SakibShadman, Saha Joy, SarkerAninda, Islam MdMinhajul, "An Intelligent Walking Stick for The Visually Impaired People", in International Journal of Online and Biomedical Engineering on Vol 13, Nov 2017.

[5] ShashankChaurasia and K.V.N.Kavitha, "An Electronic Walking Stick Forblinds", in ResearchGate article in Feb 2015.