

# Virtual Eye

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**Abstract**— Blindness is a state of lacking the visual perception due to physiological or neurological factors. The partial blindness represents the lack of integration in the growth of the optic nerve or visual centre of the eye, and total blindness is the full absence of the visual light perception. In this proposed work, a simple, cheap, user friendly, virtual eye is designed and implemented to improve the mobility of both blind and visually impaired people in a specific area. The proposed work includes a wearable equipment consists of mini hand stick to help the blind person to navigate alone safely and to avoid any obstacles that may be encountered. The main component of this system is the ultrasonic sensor, water sensor; fire sensor .The signals received from the sensors are used as inputs to Arduino microcontroller. The microcontroller carry out the issued commands to the blind as voice signal and if the bind person met with any accident then with the help of his heart beat his health condition is detected and sends the alert to registered person immediately. He can visit to that location and take care of his health and also it's useful for the old age people who lost their eye sight. The proposed system is cheap, fast, and easy to use and an innovative affordable solution to blind and visually impaired people.

**Index Terms**— Ultrasonic sensor, water sensor, fire sensor, pulse sensor, GSM, headphone.

## 1 INTRODUCTION

Vision is a beautiful gift to human beings by GOD. Vision allows people to perceive and understand the surrounding world. However World Health Organization survey made in 2017, estimated 253 million people with visual impairment across the globe. These visually impaired people face the problems of orientation and mobility in an unknown environment. Many efforts have been made to improve their mobility by use of technology. Many people suffer from serious visual impairments preventing them from travelling independently. Accordingly, they need to use a wide range of tools and techniques to help them in their mobility. One of these techniques is orientation and mobility specialist who helps the visually impaired and blind people and trains them to move on their own independently and safely depending on their other remaining senses. Another method is the guide dogs which are trained specially to help the blind people on their movement by navigating around the obstacles to alert the person to change his/her way. However, this method has some limitations such as difficulty to understand the complex direction by these dogs, and they are only suitable for about five years. The cost of these trained dogs is very expensive, also it is difficult for many of blind and visually impaired persons to provide the necessary care for another living being hence this made a demand for electronic aid for mobility, which is cost effective and user friendly. Here we have come up with a design having different approach from the traditional electronic aids available in the market. There are different causes for blindness.

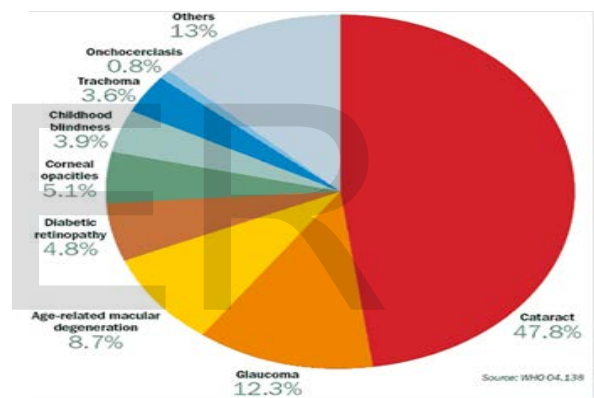


Fig.1: Causes for blindness

## 2 LITERATURE SURVEY

Some improvements have done in order to assist the blind and visually impaired people. Some of those are the Whitecane, where it could detect the objects only whenever there was a contact between the device and the obstacle. In addition, the user had to be trained for more than 100 hours in order to make the effective use of it. To overcome the above problem he introduced a device known as "NAVBELT" which consists of a belt, a portable computer and an array of ultrasonic sensors (which covered 120degrees) mounted on the front of the belt. This device enabled to detect the object at some larger specified distance. But it faced a problem of conveying the information to the user to allow him to react in time to obstacles ahead. In order to overcome this problem one more device was introduced known as "GUIDECANE"[1]. And they are concerned about the problem of conveying information to the user to allow rapid walking. The design was very complex and

bulky. It could not detect the object which was present on uneven surface. To overcome this one more person introduced wearable equipments consisting of head hat and mini hand stick to help the blind person to navigate alone safely. The main component of this system is infrared sensor, pic microcontroller and it also controls the peripheral components that alerts the user about the obstacles shape material and direction [3]. Another solution is proposed to help blind to move safely and detect obstacles in their path. It consists of a foldable stick with a pair of IR sensors mounted on it. An earphone was connected to alert the blind with speech warning message about the detected obstacles. It is a cheap mobility stick. Fast response of obstacles is ranging and up to 200 cm using IR sensors. But After identifying the obstacles, the stick alerts the visually impaired people using vibration signals. However the smart stick focused only for obstacle detection but it was not able to send the necessary information to his family whenever he met with an accident. And also the IR sensors are not really efficient enough because it can detect only the nearest obstacle in short distance [4].

### 3 METHODOLOGY

The working of the Blind Walking Stick is totally depends on the principle of automation. Four sensors are interfaced with the Arduino namely ultrasonic sensor, water detection sensor, fire sensor, pulse sensor. Arduino is an open source computer hardware and software that designs digital devices and interactive objects that can sense and control objects in the physical world. An HC-SR04 Ultrasonic sensor is a device that can measure the distance to an object by using sound waves. It measures distance by sending out a signal at a specific frequency and detects the presence of object when the signal bounce back. It is used to detect if there is any obstacles surrounding to the person. A water detector sensor is an electronic device that is designed to detect the presence of water. Fire detection sensor detects one or more phenomena resulting from fire, such as smoke and heat. As a whole the processed information from all the sensors will be conveyed to the blind person in the form of voice signal via headphone .Here the object includes water, fire, living and non-living things. To detect the health condition of the blind person during emergency we used a pulse sensor, this sensor is the one which measures the pulse rate of human heart and the data from the pulse sensor is given to arduino controller which processes this data. If it is above or below the standard health rate then it triggers the GSM to send the information about the health of the blind person to his relatives or friends and when the blind person meets with an accident, their will be fluctuation from the standard human pulse rate if so then GSM sends the information to the registered persons who are the relatives or concerned people of the blind person. Whenever blind person himself feels lost or need to take help

of others then if he presses the switch button in the stick the information is sent in the form of SMS via GSM module.

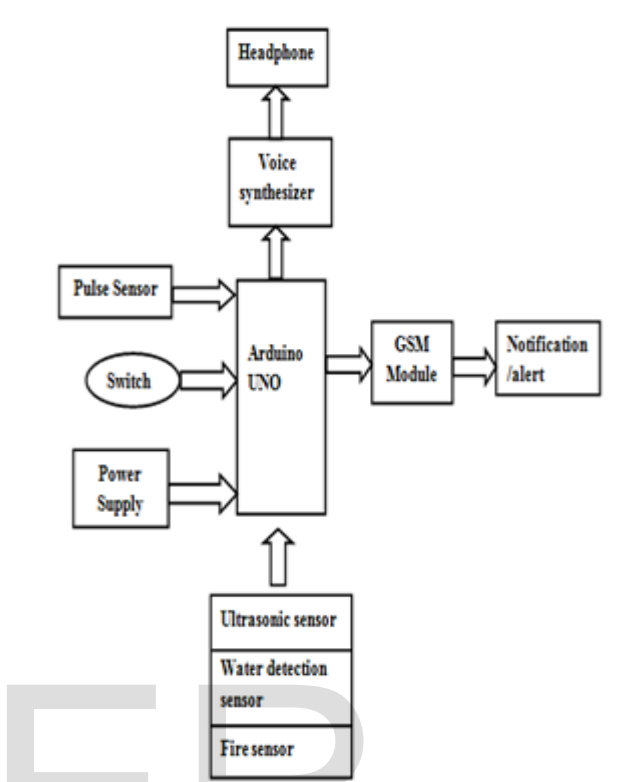


Fig.2: Block diagram for the design of Virtual eye using sensors and GSM

To detect the misplaced stick we use Voice-operated Wireless switching system. The key components used in this system are Android based phone, Bluetooth module, Arduino Uno and Buzzer. We use an android phone where an application is installed in it. To application is launched and the microphone button is tapped and the voice command is given as input which is used to switch the buzzer to beep. The voice recognizer listens and converts voice to text. The Bluetooth adapter present in the phone is configured to send this text to the Bluetooth module which is connected to the Arduino Uno board that in turn control the buzzer.

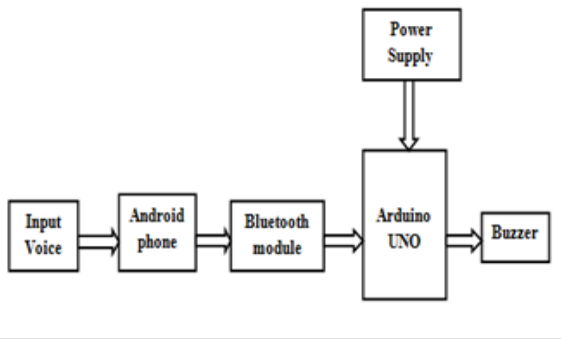


Fig.3: Block diagram for the design of virtual eye using voice controlled buzzer system

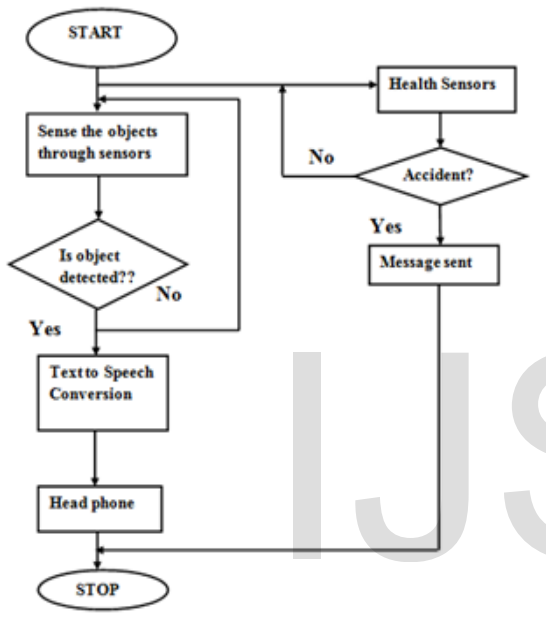


Fig.4: Flow chart of the design of virtual eye using Sensors and GSM.

#### 4 EXPERIMENTAL RESULTS

Here we have come with the system which is a mobile electronic aid for the blind with the help of which blind person can move independently. This is a automated system where all the real time information required for the blind to move safely is conveyed and his health condition is also tracked continuously and SMS is sent to his family member or authorized person during emergency.

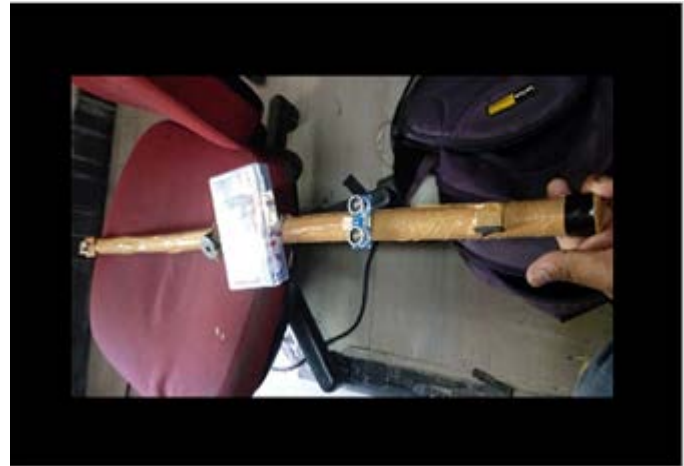


Fig.5: Experimental setup

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