Advanced Walking AID for Visually Impaired People using Ultrasonic Sensor and Arduino

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Abstract - The internet of things (IoT), is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. Some of the IoT applications are Factory Digitalization, Product flow Monitoring, Inventory Management, Safety and Security, Quality Control, Packaging optimization, Logistics and Supply Chain Optimization. And also the significant issue facing by the blind people is the reptiles like snakes and dogs for this we, proposed the walking stick repeller is utilized for outwardly impeded individuals to shield them from snakes and dog . The fundamental is blind individuals to stroll effortlessly and to be cautioned like objects & reptiles by fixing frequency range 25cm to 400cm & >255hz. Obstacle recognizing Distance and occurance of vibration can be monitored in the system . If the blind people loss their usual way means it alerts the guardian through , GPS system that provide the information regarding the location of the blind person using the stick to his family members. SMS system is used by the blind to send SMS message to the saved numbers in the micro controller in case of emergency. The programming of GPS modem, GSM modem, buzzer and vibration motor has been successfully done for this system.This device will be best solution to overcome their difficulties.

Keywords- Arduino Uno, Arduino IDE, Ultrasonic Sensor, GPS,Buzzer,Walking Stick.

I. INTRODUCTION

This walking stick is an alternative to the traditional walking stick. Here, Arduino UNO , ultrasonic sensor, IR sensor , voice playback module , LCD display and voltage regulator are used. Arduino is a microcontroller which can do all the calculations very fastly and quickly with great accuracy. Ultrasonic sensor is used to detect the object in the front of the person by measuring the distance between the object and the stick. For left and right object detection, IR Sensor is used which is very small in range. So, it detects the object which are very close. Using more ultrasonic sensor may create calculation problem. So, IR Sensor is Preferred. The voice playback module will assist the blind person to reach the destination through the command or microphone.

Visually impaired/blind persons find themselves challenging the dangerous paths to go out independently. There are millions of visually impaired or blind people in this world who are always need the help from others. To help the blind people from animals like dog and snake there is no device attached with the in build stick.Blind people have big problem when they walk on the street or stairs using normal walking stick, but they have sharp haptic sensitivity. Vision is the most important part of human physiology as 83% of information human being gets from the environment is via sight. The 2011 statistics by the World Health Organization 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 and oldest mobility aids for persons with visual impairments are characterized with many limitations. Some inventions also require a separate power supply or navigator which makes the user carry it in a bag every time they travel outdoor. The objectives of this research work include: to design an assistive technology for visually impaired people that can detect obstacles and provides alternative routes for the blind; to alarm the user through vibration to determine the obstacles direction sources; and to help the user find his stick when he cannot remember where is was kept.

II. LITERATURE SURVEY

Arhyel Ibrahim Shani et.all[1],The smart walking stick based on ultrasonic sensors and Arduino for visually impaired people. There are approximately 37 million people across the globe who are blind according to the World Health Organization. People with visual disabilities are often dependent on external assistance

which can be provided by humans, trained dogs, or special electronic devices as support systems for decision making. Thus, we were motivated to develop a smart white cane to overcome these limitations. We accomplished this goal by adding ultrasonic sensors at specific positions to the cane that provided information about the environment to the user by activating the buzzer sound. We proposed low cost and light weight system designed with microcontroller that processes signal and alerts the visually impaired person over any obstacle, water or dark areas through beeping sounds. The system consists of obstacle and moisture detection sensors for receiving, processing and sending signals to the alarm system which finally alerts the user for prompt action. The system was designed, programmed using C language and tested for accuracy and checked by the visually impaired person. Our device can detect obstacles within the distance of about 2m from the user.

Anvesh Gawde et.all[2]God gifted sense of vision to the human being is an important aspect of our life. But there are some unfortunate people who lack the ability of visualizing things. The visually impaired have to face many challenges in their daily life. The problem gets worse when there is an obstacle in front of them. Blind stick is an innovative stick designed for visually disabled people for improved navigation. The paper presents a theoretical system concept to provide a smart ultrasonic aid for blind people. The system is intended to provide overall measures – Artificial

vision and object detection. The aim of the overall system is to provide a low cost and efficient navigation aid for a visually impaired person who gets a sense of artificial vision by providing information about the environmental scenario of static and dynamic objects around them. Ultrasonic sensors are used to calculate distance of the obstacles around the blind person to guide the user towards the available path. Output is in the form of sequence of beep sound which the blind person can hear.

Deepika et.all[3],The Blindness is frequently used to describe severe visual impairments with or without residual vision. The application of ultrasonic ranging scheme for producing electronic walking stick for the blind is a technological advancement. There is a great dependency for any type of movement or walking within area or out of the particular area, they use only their natural senses such as touch or sound for identification or walking . To overcome all these problems of blind people, we are developing a project by using simple available technologies. This walking stick for blind people has multiple sensors, with the help of which it has been possible to enhance more features to the walking stick. The features are to detect the obstacle for collision avoidance, it detects the object in directions up, down and front. The other sensor placed near bottom tip of the

walking cane to find the pits on the ground. We integrate these sensors to the voice record and play chip. In this project, sensors play a key role to detect the objects in all directions and thus help blind people to be independent.

Emmanuel Gbenga et.all[4],Research effort have been focused on the design of Electronic Travel Aids (ETA) to aid the successful and free navigation of the blind. Also, high-end technological solutions have
been introduced recently to help blind persons navigate independently. Another reason why ultrasonic is prevalent is that the technology is reasonably cheap. Moreover, ultrasound emitters and detectors are portable components that can be carried without the need for complex circuit. RF module will help the person to find the stick wherever it is placed. Whenever the 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.

Farhana et.all[5],Ultrasonic blind walking stick with the use of arduino. According to WHO, 30 million peoples are permanently blind and 285 billion peoples with vision impairment . If u 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. They have to face more struggles in their life daily life. Using this blind stick , a person can walk more confidently. This stick detects the object in front of the person and give response to the user either by vibrating or through command. So, the person can walk without any fear. This device will be best solution to overcome their difficulties.

Kher Chaitrali S et al.,[6], presents the visually impaired have to face many challenges in their daily life. The problem gets worse when they travel to an unfamiliar location. Only few of the navigation systems available for visually impaired people can provide dynamic navigation through speech output. One more application is designed for family members to access the blind person's location through the server whenever needed.It aims to solve the problems faced by the blind people in their daily life. The system also takes measures to ensure their safety

Pauline Jothi Kiruba et.all[7],The blind and impaired people are suffering a lot because there are so many struggles for blind peoples to reach their destination and also there are dangerous risks that blind persons must face. To avoid uncomfortable walking experience, we have designed a smart electronic walking stick for blind people. Our paper proposes a low-cost walking stick based on latest technology and a new implementation are made for efficient interface for blind people. Basically, the ultrasonic sensor is implemented in the walking stick for detecting the obstacles in front of the blind/impaired persons. If there are any obstacles, it will alert the blind person to avoid that obstacles and the alert in the form of

buzzer. daily in different aspects in order to provide flexible and safe movement for the people. if the blind using ultrasonic sensors. The buzzer and vibration motor are activated when any obstacle is detected. In addition, the stick is equipped with GPS and SMS message system. GPS system provide the information regarding the location of the blind person using the stick to his family members. SMS system is used by the blind to send SMS message to the saved numbers in the microcontroller in case of emergency. The programming of GPS modem, GSM modem, buzzer and vibration motor has been successfully done for this system. Computer simulation is done to essence the performance of the system using Proteous software.

III. RELATED WORK

Moving through an unknown environment becomes a real challenge for the blind or impaired people. Those who go out from the house with the white stick, often use well-known routes and difficulties with new ones. Moreover, many people simply afraid of being helpless in constant movement of people, vehicle and other road users. It is therefore advisable to offer new solutions of the problems with existing technologies. This paper proposes the design and develops a portable stick for a blind people/impaired people for convenient use and navigation in public and private place.

The developed prototype gave good results in detecting obstacles placed at a distance in front of the user. Obstacles and pit can be determined easily by sensor readings. This walking stick is an alternative to the traditional walking stick. Arduino UNO , ultrasonic sensor, IR sensor , voice playback module are used. Arduino is a microcontroller which can do all the calculations very fastly and quickly with great accuracy. Ultrasonic sensor is used to detect the object in the front of the person by measuring the distance between the object and the stick. For left and right object detection, IR Sensor is used which is very small in range. So, it detects the object which are very close. Using more ultrasonic sensor may create calculation problem. So, IR Sensor is Preferred. The voice playback module will assist the blind person to reach the destination through the command or microphone.
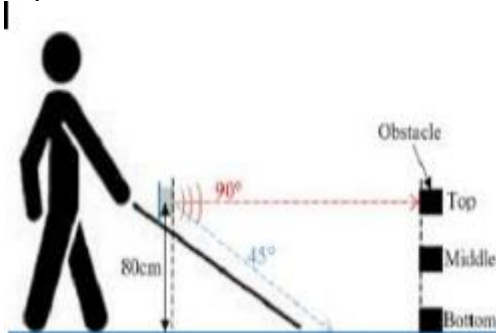

Fig.1. Obstacle distance measurement.

IV. WORKING MODEL

Smart stick comes as a proposed answer for enhance the versatility of both visually impaired and outwardly impeded individuals. When they walking and moving around, they was not able to feel in and around visually. The important problem is the dangerous reptiles like snakes and the animals like dogs. In this project we proposed the smart stick repeller is used for visually impaired people to protect them from snakes and dogs. The main objective of this project is Blind people to walk with ease and to be warned whenever their walking path is obstructed with objects, people, animals and reptiles.

Fig.2. Frequency range.

The ultrasonic dog repellant uses a standard 555 timer IC1 set up as an oscillator using a single RC network to give a 40 kHz square wave with equal mark/space ratio. This frequency is above the hearing threshold for humans but is known to be irritating frequency for dog and snake.
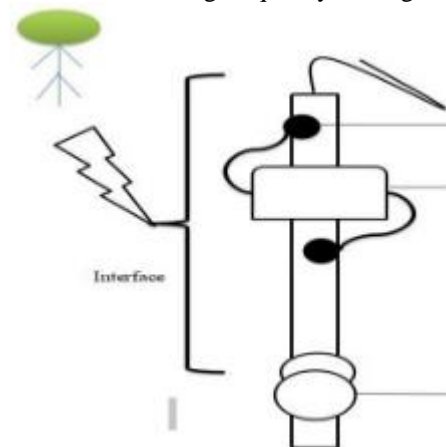

Fig.3. Interfacing.

5.The analyse of user experience has described the problems faced by the blind people are differ by the age of the person. The 10 to 20 age people has faced the

problem in length of the stick and with the range in the frequency up to 25 cm . The aged people has faced the same problem in the length but they have experienced in the walking area of the field already.

Analysed Person Name is Nivash in the age 10 & Marippan in the age 65 From THE UNITED Orphange

Disabled People @ opposite to CRI , Sathy road , Coimbatore.

Guideness how to on the stick , usage of the stick working by holding the stick while working in the area , when the obstacle identified to conform the length the stick has to be straight facing towards the obstacles and the sensor will alert with a high sound ,modify the length stick according to user friendly, change in frequency range upto 30 cm, animal and reptile sound is helpful . It will be helpful when both the disabled person like deaf and dump&blind.

Fig.3.2. User Experience.

V. CONCLUSION

The smart walking aid using ultrasonic sensor with arduino is used to detect the obstacles in a frequency range up to 25cm to 400cm. The continuous mild sound from the buzzer connected with the sensor and arduino emit the amplitude for the animals and also calculate obstacle distance, vibration . GPRS can alert the guardian of the blind people when they loss their way. In future we are going to implement as a product with some more features like voice recognition and inbuilt camera of a low cost and efficient one. Advantage of the product to the society which is applicable in the low cost and efficient one so that the middle class blind people can able to buy the stick.

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