BLIND ASSISTANCE SHOES

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Abstract - The main objective of this project is to provide an acoustic assistance to the visual impaired people and also to deal with the problems faced by them to walk like the normal human beings. Thus, the project aims to develop a device that would serve as a guiding assistance to them. The paper focuses on designing a device for blind people that would help them to travel independently and also with more ease. One of the biggest problems of visual impaired people is while travelling because when they walk in the indoors and outdoors, they are not well aware of information about their location and orientation with respect to traffic and obstacles on their way unlike the normal beings. The technology proposed in the paper serves as a solution for visual impaired people. The project consists of the smart shoes that alerts visually-impaired people over obstacles coming between their ways and could help them in walking with less collision. The main aim of this paper is to address a reliable solution encompassing of a shoes that could communicate with the users through vibrator alert.

Keywords:- UR sensors, vibrator sensors, Bluetooth module, moisture detector, smoke detector, Arduino Uno, LDR sensor, GSM Module, GPS Module.

1. INTRODUCTION

According to survey of WHO (World Health Organization) held out in 2011 we come to know that in world about 1% of the human population is visually impaired and amongst them about 10% is fully blind. The main concern for blind people is mobility. They need to depend on other for mobility. This approach

Present a tool for visually impaired people that will help them to navigate. Now this system consists of sensors and vibrators for sensing the surrounding environment and giving feedback to the blind person of the position of the nearest obstacles in range. The idea is to extend the senses of the user through this after a training period, without any sensible effort. We propose smart shoes for blind people. Electronic component is fixed in shoes of users. User will wear shoes for easy mobility. Sensors will sense obstacles, vibrators will vibrate for left/right turn through path. Using smart shoe, blind people need not to be depend on others for mobility. The system is able to update about the change in the environment things that are harmful for the user which is not present in the prior invention for example: there is no feature to give environmental condition present around the user such as fire, light intensity, hole on road, stairs etc. In this system the support of AI (artificially intelligence) for speech recognition to guide the user from sources to destination is available i.e., google assistance is used which will guided the user about the path from source to destination.

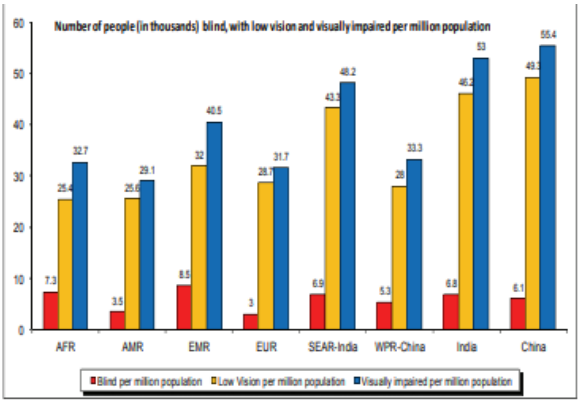

Figure 1.1: Graph estimating the blind population in world

The Figure 1.1 depicts the status of the population of the blind people or the visually impaired people over the total population. India contributes about 21% of the blind people over total population. Among every 179 people, there is 1 blind person. In a million population, there are around 53 persons that are visually impaired, 46 thousand are having low vision and around 7000 have completely lost their vision.

This paper describes the architecture and discusses the possible benefits of the system we have designed. In this work, system is designed which is cheap, a simple friendly user, smart blind guidance system. It is implemented to improve the mobility of both blind and visually impaired people in a various area.

2. LITERATURE SURVEY

In 2013, Harshad Girish Lele, et al, said that technology can remove the barriers between the humans and their illness. There are various methods to measure the distance between the obstacles and overcome the problem of blind people. One of the methods is the use of ultrasonic sensors in the shoe implemented in the form of an array around the sole.

In 2012, M. Nassih, quoted that the smart stick for the blind people can also use the technique of RFID (Radio Frequency Identification) to detect the objects or the obstacles in front of user. This invention is just like a simple stick used by blind people but equipped with a bag also. This bag provides electricity supply and indicates user by the speaker.
However, there were some limitations.

In 2013 Alshbatat and Abdel Ilah Nour cited "As per this paper, it gives importance to the stick used by the blind people. The guide cane is designed to navigate visually impaired ones. This guide cane is somewhat heavier than the white Cane".

In 2012 Muhsin Asaad H., **et al,** under this paper, the technology upgraded to one step more. The cane is able to detect above the knee level upto the 2 or 3 feet. When an obstacle is detected, this stick vibrates or makes a sound.

In 2015 Syed Tehzeeb Alam said that related to the guide cane there was also a smart cane invented with almost same configurations. This cane uses ultrasonic sensors and the servomotors to detect the obstacles. There is a microcontroller inside the cane which will work on the received instructions like right, left, straight etc. However, this system also has some limitations like it not easy to handle and requires large area or space to be placed because they cannot be folded. Additionally, this cane, due to the presence of large number of ultrasonic sensors and servomotors, is very expensive. So, every blind person cannot afford it.

- From the above survey it was depicted that following were the loopholes in the conventional technologies invented for the blind persons:
- There are many models that already have been made and have been implemented for helping the visual impaired people that help them in walking on the roads approximately equal to that of normal one.
- The existing technology does consist of the smart stick but they fail to serve the basic purpose of providing them the tools which they can carry with ease and without absolutely no embarrassment.

- One of the major limitations of these existing technologies is that these technologies are expensive. And also causes implementation problems when acquired in the real world.

Existing System-

Stick is provided to blind or visual impaired people to navigate path. Using stick, blind people come to know about obstacles but they need someone to navigate path. Use of stick is not efficient. It becomes harder for blind people for mobility. Dependency of these people has been increased. Other option is to provide the best travel aid for the blind is the guide dogs. Dogs are trained according to their owner requirement. Complex situations like cross walks, stairs, potential danger, know paths and more is detected, analysed. The animal pass Most of the information through tactile feedback by the Attitude of his dog is analysed and the user is able to feel the situation and also give him appropriate orders. But guide dogs are still far from being affordable around the price of a nice car, and their average working time is limited.

3. PROPOSED SYSTEM

To overcome the above defined limitation of the existing technology for the visual impaired people, we have modified the usage of this technology and results in the integration of modules, resulting in single unit or as single equipment known as “Blind Assistive Shoes”.

We are proposing novel technique based on IOT implementation. Wearable device i.e. smart navigational shoe is proposed. Electronic kit is fixed in shoes which can be used by blind or visual impaired person. Hardware kit consists of three vibrators, one Arduino, Bluetooth connection and sensors with Artificial intelligence. We have used shoes and are connected with each other via Bluetooth. This technology solves the minor problems that were arising due to the usage of the single module only.

4. GENERAL FLOWCHART

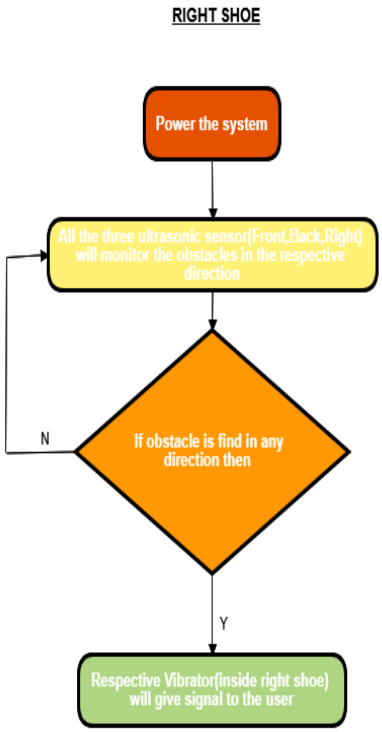

Figure 4.1: Flow Chart of Right Shoe

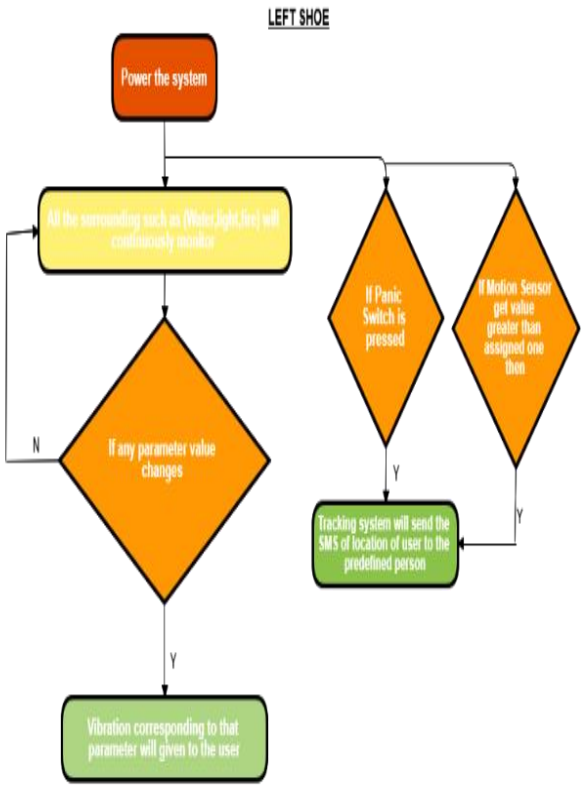

Figure 4.2: Flow Chart of Left Shoe

5. HARDWARE COMPONENTS

The proposed idea for the integration of two modules into a single unit comprises of following hardware components:

- Arduino Uno (ATMEGA328)
- Ultrasonic sensors (HC-SR04)
- Smoke Sensor
- LDR Sensor
- Water Sensor
- Bluetooth
- GSM Module
- GPS Module
- Vibrator Motor
- Motion Sensor
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6. DETAILED DESCRIPTION OF THE PROPOSED IDEA

The proposed idea comprises of modules (left shoe and right shoe) which are integrated together to form as a single device or unit. The detailed description of both modules is as follows: -

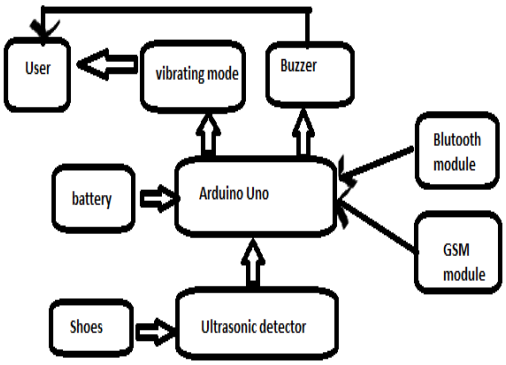

Figure 6.1: Block diagram of Shoe Module

The block diagram comprises of following blocks:

a) **Arduino Uno:** This is the main controller of the shoe module which receives the command from both the sensors and gives command to the vibrator as per signal received.

b) **Ultrasonic Sensor:** This device is used to detect the distance from the sensor to the target object. In this project we used this device to detect the obstacles. We have used three sensors for front, side and back in right shoe.

c) **Bluetooth**: This device is used to interconnect both the modules via Bluetooth wireless technology. Due to this interconnection, both have communication of signals to execute commands.

d) **GSM Module:** GSM Module is a mobile module that can be used and control by giving commands through its serial port. It sends the co-ordinates of the location of blind person.

e) **Smoke Sensor**: It is a device that senses smoke typically as an indicator of fire**.** It gives the vibrator, pulses as high-low-low-low.

f) **LDR Sensor:** It is light sensitive device most often used to indicate the presence or absence of light. When the amount of light intensity goes below normal

condition, pulses are sent to vibrator as high-low.

g) **Water sensor**: It is used to detect presence of water by sending pulses to vibrator motor as high-high-high-low.
h) **GPS Module**: This device gets the signal from each GPS satellite which is used to determine the position of blind person in three dimensions.
i) **Vibrator motor**: It used for testing the impact force. It has high vibration detection sensitivity.

7. WORKING MODEL

A complete and reliable sensing system for obstacle detection can value a lot from the collective usage of numerous types of sensors, especially from the active - passive combination. Any precise type of technology may have hitches to meet all necessary necessities in order to detect an obstacle in various lighting or weather conditions. The muddle background and intricate moving patterns of all objects which may appear on a road scene in urban streets demand erudite processing of sensor inputs. In order to overcome this problem, a sensor - fusion and segmentation approach can be used. From the technology's point view, different sensing technologies such as ultrasonic sensor, microwave radar, AI (artificially intelligence) can be used for obstacle detection task. The main problem is to design algorithms that are robust enough to reliably detect and warn for any obstacles that can appear in front of the user on the road area.

This system uses ultrasonic sensor for distance dimension in the enlargement of an obstacle detection system for senior and people with vision impairment. Investigational results show that ultrasonic and infrared sensors have diverse characteristics in terms of output voltage measurements. It is clearly designated that ultrasonic sensor gives a linear output representative whereas infrared sensor shows a nonlinear output representative. Both sensors are able to detect an obstacle at the distances within their usable range with percentage of precision between 95% and 99%.

Vibration and voice operated navigation system developed using ultrasonic sensors to detect obstacles. Since visually impaired people are more sensitive in hearing and possesses strong perception than ordinary people. So, this system gives alert through vibration and voice feedback. System works in indoor as well as outdoor navigation and focus on continuously sensing surround obstacles and alerting through vibration and voice feedback. Depending upon the distance between obstacle and user different intensity levels are provided to vibration motor to alert user's mobility.

Provides a comprehensive summary of state-of-the-art techniques, which are used for navigation systems for visually impaired people. It concludes that navigation systems have not achieved large-scale advantages mainly due to unaffordable costs, accuracy and usability. Further, in the future, navigation systems need to firstly reduce the installation expenditure by curtailing the infrastructure disagreements that is required for confining the consumer. Usability can to be enhanced by curtailing the amount of sensors users have to carry and also providing usable directions in a vigorous modality of feedback. Systems need to take into account the user's special necessities, minimize intellectual load, cost effective, user friendliness and minimize any meddling from the surroundings.

8. CIRCUIT DIAGRAM

The Figure below represents the circuit diagram of the shoe module that comprises all the inter connections of the modules that helps in the complete practical realization of the respective protocol. In the module circuit i.e., the shoe module, we have Arduino Uno controller along with three UR sensors, for the front detection, for the right detection and, for the left detection, a Bluetooth module for the communication.

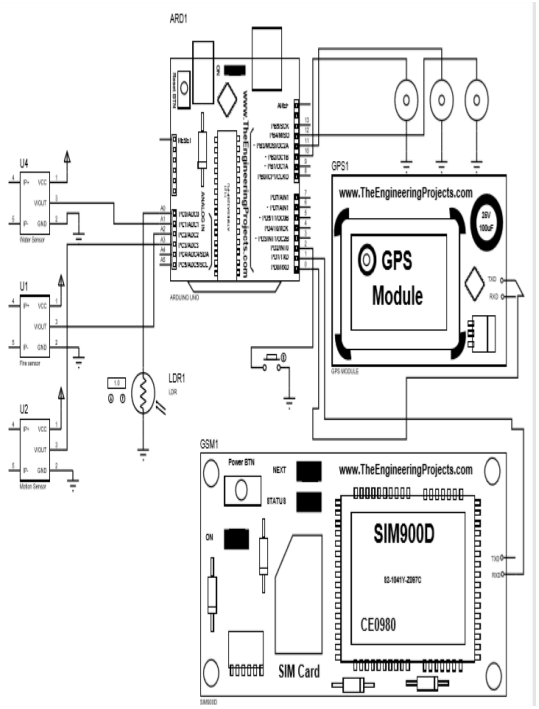

Figure 8.1: Circuit Diagram of Left Shoe Module

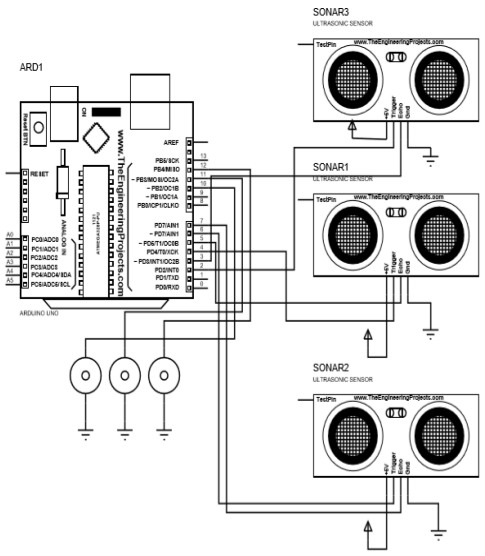

Figure 8.2: Circuit Diagram of Right Shoe Module

9. HARDWARE VERIFICATION

For the physical or the hardware verification of the circuit proposed the whole shoe module was implemented on a bread board and the result of the obstacle detection was taken on an android app. The idea of the hardware verification can be easily understood by the following flowchart shown in the figure 6:

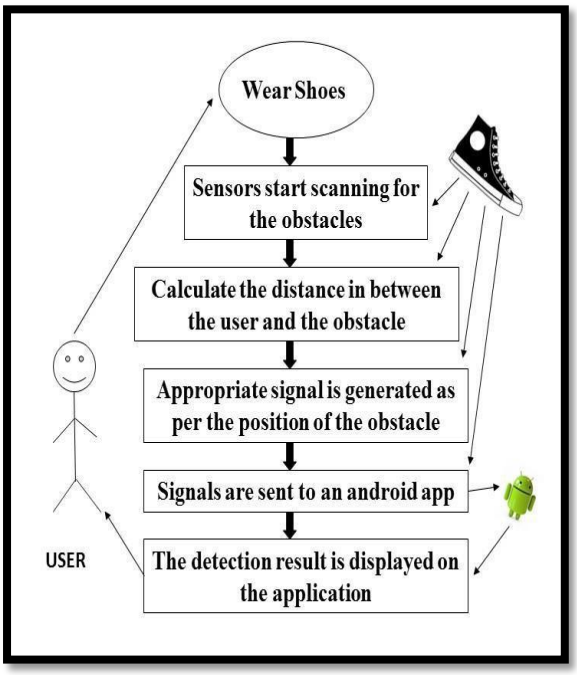

Figure 9.1: Diagram to depict hardware verification

The first step to use the system is make sure the battery is fully charged then wear the shoe and then connect it to Bluetooth of user phone then give the instruction to the Assistance according to our destination location, then the assistance will guide the user according to destination path by giving proper instruction about the direction.

After that the system will guided you about the things surrounding to user such as obstacles, water detection, light intensity, crowded places, and fire detection and so on. The panic system is also get started when the system is power on, so if the user is facing some problem, they can press the panic button. So, the location of the user is sent to their respective family member and they can rescue the user.

10. ADVANTAGES

- A reliable assistive technology providing a vibration feedback as per the surrounding.
- An ease to carry the project without any embarrassment.
- Improved sensing range than the conventional technologies offering a haptic feedback upon sensing.
- Offering independency to the subject so he can be able to walk on streets without the need of an external assistance.
- Provide good accuracy.
- Distraction-free travel.
- This system is applicable for both the indoor and outdoor environment.

11. FUTURE SCOPE

It has been observed that developed support system- is accurate in detecting the obstacle at the ground level and alerting the visually impaired person find their way by passing every obstacle that comes on their way to the destination. So, firstly we will work on designing such application that will detect the obstacle on the knee level and for left side too. And then integrate both the modules by the Bluetooth connectivity. Future work will be focused on enhancing the performance of the system and reducing the load on the user by adding the camera to guide the blind exactly. Images acquired by using web camera and NI-smart cameras helps in identification of objects as well as scan the entire instances for the presence of number of objects in the path of the blind person. It can also detect the material and shape of the object. Matching percentage has to be nearly all the time correct as there no chance for correction for a blind person if it is to be trusted and reliable one. The principles of mono pulse radar can be utilized for determining long range target objects. The other scope may include a new concept of optimum and safe path detection based on neural networks for a blind person.

CONCLUSION

The above proposed idea depicting the integration of the module of the protocol into a single unit overcomes almost all the limitations that were in the previous versions of the technology. Thus, this technology becomes a reliable partner for the visually impaired people in every situation. This system will detect the presence of the obstacles coming in the front of the blind person and then alert them about the direction of the obstacles so that they can walk with ease. The system comprises of the sensors that receives signals and then send commands to the controller which executes it further about the direction thus, allowing the blind person to walk independently among obstacles. This project offers a numerous application in the medical field to provide a better responsive mate to the visually impaired. For the NGO's working for the visually impaired to provide such assistive technology.

The system has been used to receive data from the sensing devices, two connected to the shoe to detect objects at the ground. Then, as per the information received by the Arduino, it provides an acoustic feedback to the user. Thus, allowing the blind person to move independently, safely and quickly through the obstacles and danger zones areas. This system doesn't require a huge device to hold for a long, tenure and distance and it also doesn't require any special training for its utilization by the subject. Hence, this project proves to be a boon for the bind or the visually impaired offering a great and much needed independence to them. Thus, our objective of eliminating the dependency of blind person is successfully achieved.

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