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DRISHTI – A PORTABLE PROTOTYPE FOR VISUALLY IMPAIRED

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Abstract - *Drishti is a portable device to help blind people. This prototype helps to navigate the blind people with greater comfort, speed and confidence, whilst making use of ultrasonic waves to detect the nearby obstacles and to notify the user through vibrations and includes live location tracking of the blind people to the caretaker. The idea was inspired from bats, who also use sound waves of high frequency to move.*

According to an estimate, there are 285 million visually impaired people in the world. The loss of one the most important human senses cause them a lot of hardships in daily life. The affected ones have been using the traditional white cane since many years which although being effective, still has a lot of disadvantages. Another way has been a pet animal such as a dog which is not very common for being comparatively expensive. So, the aim of this project is to develop a cheap, yet more efficient way to help the visually impaired navigate with more speed and confidence.

1. INTRODUCTION

Third eye for people who are blind is an innovation which helps the blind people to navigate with speed and confidence by detecting the nearby obstacles using the help of ultrasonic waves and notify them with buzzer sound or vibration. They only need to wear this device as a band or cloth.

According to WHO 39 million peoples are estimated as blind worldwide. They are suffering a lot of hardship in their daily life. The affected ones have been using the traditional white cane for many years which although being effective, still has a lot of disadvantages. Another way is, having a pet animal such as a dog, but it is really expensive. So, the aim of the project is to develop a cheap and more efficient way to help visually impaired to navigate with greater comfort, speed and confidence.

This is the first wearable technology for blind people which resolves all the problems of existing technologies. Now a days there are so many instruments and smart devices for visually impaired peoples for navigation but most of them have certain problems for carrying and the major drawbacks is those need a lot of training to use. The one of the main peculiarities of this innovation is, it is affordable for everyone. There are no such devices available in the market that can be worn like a cloth and having such a low cost and simplicity. When used on a large scale, with improvements in the prototype, it will drastically benefit the community.

With addition to the ultrasonic sensors, buzzers and vibration motors we have included Global Positioning System (GPS) module and Global system for mobile communication (GSM)module that utilizes SMS technology which is a popular, inexpensive, convenient and reliable way of transferring and receiving data that sends the message to caretaker about the location of the visually impaired.

This design monitors the location continuously of the blind by sending an alert message using GSM module as soon as the location is requested by the caretaker. The SMS consists of the latitude and longitude coordinates of the visually impairer's location tracked using GPS module.

Thus, with this system, the visually impaired can detect the object easily and the location of the person can be monitored.

1.1 Objective:

- To add a third method to the existing lot of two most common navigation techniques by the visually impaired (A simple stick- "The white cane" and A pet dog).
- To use accurate ultrasonic ranging method by the use of sensors to detect obstacles and to notify the user about their presence near them in different directions through vibrations and sound beeps.
- To make it battery operated, long lasting, portable, open source, easily usable and explicit in calculations.
- To make the device easily affordable by everyone.

1.2 LITERATURE SURVEY

In the past few years, there has been innovations and development of various techniques and devices or gadgets guiding visually impaired people, thus towards attaining their independent or free movement around the surroundings without any other individual's support. Few parameters are there but they are having some limitations and restrictions.

D. Dakopoulos, N.G. Bourbakis, "Wearable obstacle Avoidance Electronic Travel Aids for Blind; A Survey" proposed that a relative survey among mobile obstacle detection systems in order to inform the research community and users regarding the abilities of this project and regarding the innovation in adaptive technology for the sightless people. This study is based on different attributes and performance specification of this system that arranges them in categories, offering quantitative-qualitative analysis.

Mr. Ungar S, "Blades comparing methods for Introducing Blind and Visually Impaired People to unfamiliar urban environments". He proposed methods for the unsighted people of urban areas. But they didn't consider the people who cannot afford equipments of high cost. Drishti overcomes this drawback.

Ms. Pooja Sharma, " A Review on Obstacle Detection and Vision"[4]. She analyzed that objects can be detected, but there are drawbacks in terms of angles and distance . On the other hand, Drishti for blind has a wide angle for the detection which can be widened with respect to the range of the sensor.

Hugo Fernandesc, João Barroso, "Blind Guide: an ultrasound sensor based body area network for guiding blind people" . The research introduces supportive formula for sensing obstacles for the sightless persons who generally take help of white-cane or the pet dog, thus for the detection of obstacles by using this device provides a proper solution to the blinds. Based on the Body Area Network of ultrasonic sensors that generate sound-based response, this solution is given. The Body Area Network can be inserted inside cloth fabric, emancipating sightless person from utilizing the seeing-eye dog or that white-cane.

Today's Innovative world is providing many solutions to the visually impaired for example; white-cane having a tip for assisting the movement of the blind people. The cane has different types used in today's technological world in the form of white cane, laser cane and smart cane. Dogs trained for this purpose are too expensive and unaffordable for certain people. The study discovered that the remote guidance system being very hard to move hence this device will act as most optimized version

2. Methodology

Figure 1 shows the block diagram of the main module of the prototype which consists of Arduino nano which is the main processor, ultrasonic sensor which is used for object detection, GPS and GSM module used for tracking the location of the user and vibration motor to notify the user about the object ahead by its vibrations.

Figure 2 shows the block diagram of the other module of the prototype which only consist f Arduino nano which is the main processor, ultrasonic sensor which is used for object detection and vibration motor to notify the user about the object ahead by its vibrations.

2.1 Vibration motor

Vibration motor is a compact size coreless DC motor used to informs the users of receiving the signal by vibrating, no sound. Vibration motors are widely used in a variety of applications including cell phones, handsets, pagers, and so on.

The main features of vibration motor are the magnet coreless DC motor are permanent, which means it will always have its magnetic properties (unlike an electromagnet, which only behaves like a magnet when an electric current runs through it);

Another main feature is the size of the motor itself is small, and thus light weight. Moreover, the noise and the power consumption that the motor produce while using are low. Based on those features, the performance of the motor is highly reliable.

Fig1 :Vibration Motor

2.2Software Requirements

Here the software used is Arduino IDE. The Arduino Integrated Development Environment or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them.

The Arduino libraries used are as follows:

i. Software Serial library

The Software Serial library allows serial communication on other digital pins of an Arduino board, using software to replicate the functionality(hence the name"Software Serial"). It is possible to have multiple software serial ports with speed up to 115200 bps. A parameter enables inverted signaling for devices which require that protocol.

ii. TinyGPS++

TinyGPS++ is a new Arduino library for parsing NMEA data streams provided by GPS modules. It is the immediate inheritor of TinyGPS, a popular compact parser that is used in Arduino installations around the world. TinyGPS++ is not

quite as 'tiny'as its older sibling, but its powerful and extremely easy-to-use new object model and useful new feature set make it an attractive alternative. Like its predecessor, TinyGPS, this library provides compact and easy-to-use methods for extracting position, date, time, altitude, speed, and course from consumer GPS devices.

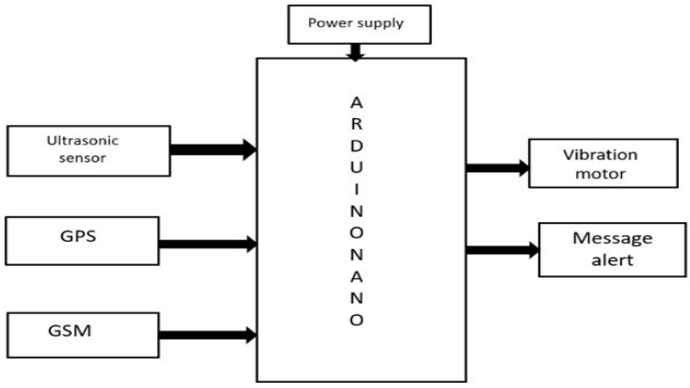

Figure 2:Block Diagram for Main module

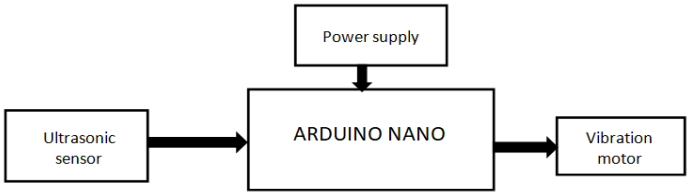

Figure 3:Block Diagram for other modules

MODULE 1	TOWARDS THE FRONT
MODULE 2	ON THE RIGHT ARM
MODULE 3	ON THE LEFT ARM
MODULE 4	ON THE FOOT

2.1Working of the project

- The components are connected to the Arduino as shown in figure2.
- At the end, after all the connections are done to the Arduino board, upload the code to Arduino board and power the module using the power supply.
- The Ultrasonic sensor here used as a transceiver.
- An ultrasonic sensor transmits the ultrasonic waves with frequency 40KHz and simultaneously microcontroller starts the clock.
- The ultrasonic wave travels to the object, get reflected back by the object and again travels towards the sensor
- The clock stops and measures the time interval at the moment ultrasonic waves is detected back by the receiver part of the sensor.
- Now, microcontroller calculates the distance of object by using this time interval and as speed of sound is constant in air. The distance is calculated using:
- Distance = Speed × Time
- This is the distance travelled by the ultrasonic wave but the actual distance between sensor and object is half of this distance as the wave also travelled all the way back too. So,
- Distance = Distance / 2
- Now this distance is the actual distance between Sensor and the object.
- Hence, the distance calculation is calculated and the sensor detects and the further procedure of the buzzing sound to the user is carried out.
- The current location of the person is tracked by the guardian through GPS and GSM module.
- This design monitors the location continuously of the blind by sending an alert message using GSM module as soon as the location is requested by the caretaker.
- The SMS consists of the latitude and longitude coordinates of the visually impairer's location tracked using GPS module.

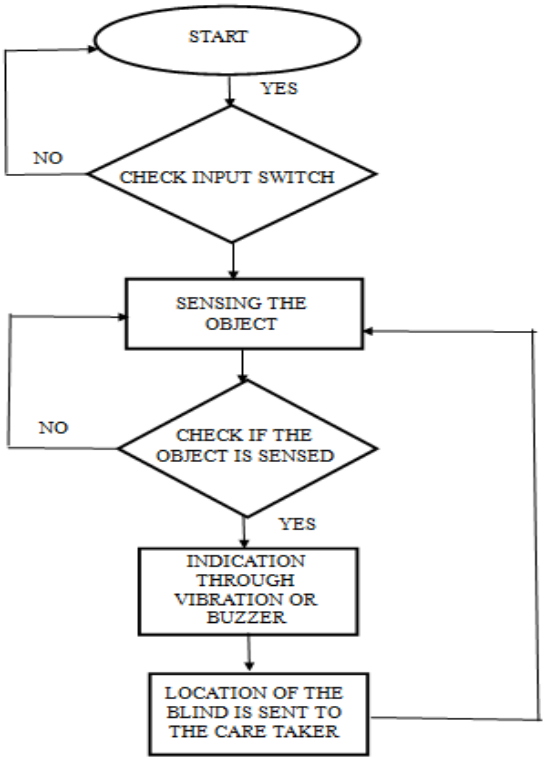

Figure 4 Flow Chart of the design of the prototype

3. RESULT

The system is created and designed for visually impaired people. This device helps the visually impaired people to handle several states and responds to the user in every environment. All the conditions can be easily met by the blind individual using ultrasonic sensor and the Arduino board. After the analysis of this device individually, we have seen the project works perfectly. Therefore, we have effectively implemented the prototype of the entire system, which we planned initially. The whole system is divided into 4 modules, one for each arm, one for the hip and one for the foot of the user as shown in figure 5.

Fig -5: Prototype

This device will help the visually impaired people to know about the obstacles in every direction.

1. CASE 1: If the obstacle lies on the west/left side of the person, the device will let the person know that there is an obstacle on the west/left side which is shown in figure 5.

2. CASE 2: If the obstacle lies on the east/ right side of the person, the device will let the person know that the obstacle lies on the east/right side which is shown in figure 5.

3. CASE 3: If the obstacle lies in front of the user, it will tell the user that there is an obstacle in front of the user which is shown in figure 5.

This design monitors the location continuously of the blind by sending an alert message using GSM module as soon as the location is requested by the caretaker. The SMS consists of the latitude and longitude coordinates of the visually impairer's location tracked using GPS module.

Thus, with this system, the visually impaired can detect the object easily and the location of the person can be monitored

Abbreviations in the title or heads unless they are unavoidable.

3. CONCLUSIONS

With the improvement of the living standards of the people, we have become so materialistic that we have forgotten how the physically disabled people live a tough life. They undergo rigorous, indifferent behavior towards them for being physically disabled. They become dependent on other people in a way for their day-to-day routine chores.

Thus, the project, Drishti is made sightless individuals to live independently, so as to perform their daily activities easily and more confidently with high level of safety.

This Arduino based concept for the blind people is simple, cheap and can be easily carried and maintained. This system is able to scan and detect the hindrances in all directions irrespective of the height or depth the object lies at and locate the user.

With this project, the blind can enjoy the taste of sight and can move freely from one place to another without assistance of the other individual.

Future Scope

- In future with the advancement of quicker response of sensors, like the usage of top-notch sensors it can be made highly useful.
- The modules that one needs to wear as a bracelet or on any other part of the body can be transformed into a wearable clothing like a coat, so that it can be made fit for working.
- Camera module and Audio assistance can be embedded into the project for better assistance.
- There can be more advancement in this device for instance we can use piezo electric plates in the shoes of the user which can generate sufficient electricity that the modules can run on.

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