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SMART SHOES FOR VISUALLY IMPAIRED USING IOT

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Abstract - *The proposed study is for Visually Impaired People which helps them to accomplish their tasks. Visually Impaired People face issues while travelling outdoors, this paper presents a literary review of overcoming such issues by making wearable sensors by planting them on shoes using IOT (Internet of Things). Use of ultrasonic sensors and buzzer to notify the end-user regarding upcoming obstacles. Sending of data using Wi-Fi module such as footstep count, calories burned with the help of accelerometer and storing it on the cloud and displaying it to the users on the mobile app. This also helps them to actively take part in fitness activities and lead a healthy life.*

Key Words: Accelerometer, Ultrasonic, Wi-Fi, Internet of Things (IOT), Sensors

1.INTRODUCTION

Sight is considered the most important sense and blind people are observed upon with pity by others. Visually Impaired face difficulties moving and transporting from a place to another whereas normal people don't face such hurdles. Shoes are the basic common thing which the man uses and to provide wearable technology inbuilt with it makes it easier to track their tasks. Such technologies have already been implemented for mankind but it is quite difficult for the Visually Impaired to view or understand what's going on in the surroundings or with the technology they are using. To make the life of Visually Impaired people easy going we introduced this proposed study where they can track their footstep count, calories count and alert themselves to the surrounding chaos via voice command. We used wearable technologies and the Internet of Things (IOT).

Wearable technology is an electronic device that can be worn as accessories like Fitbit, smartwatches and many more. Wearable devices are compact and unobtrusive to the users and one can work with them comfortably. In our proposed work we used Ultrasonic sensors to detect an obstacle. This wearable device is planted on the shoes and a buzzer will go on once it encounters any obstacle.

IOT is a recent technology that creates a global network of devices that are capable of communicating and exchanging data with each other through the internet. This technology makes it easier for the user to communicate with the device. Several studies have found that physical activity or exercise can improve your health and reduce the risk of developing several diseases and helps to battle depression. People nowadays use the footstep count app on the mobile or wearable device to keep track of the daily exercise activities and can view it anytime which motivates them to do better every day. For visually impaired people it becomes a difficult task because they cannot view their daily progress on the app. To overcome this problem, we interfaced wearable technology with IOT and users can receive the status of their activity via voice command. This physical device is favourable, compact and gives hands-free access to computers, thus escalating everyday tasks.

2. LITERATURE SURVEY

[1] This paper proposed the use of ultrasonic sensors. The ultrasonic sensors are the main obstacle detection device here. It sends an echo signal & from that calculates the total distance of an object from shoes. It offers lots of advantages over a blind stick. Such kinds of shoes make hands free which can be can utilize them for holding any stuff or railing while ascending or descending the stairs. The shoe also includes sensors to detect obstacles such as sidewalks, staircases, etc. Ultrasonic sensors calculate the distance of the hurdles present in the way.

[2] A pedometer or step counting mechanism is one of the best to provide aid in the field. Many designs with motion sensors like accelerometers are already popular in the market. The Accelerometer-based pedometer works using an algorithm along with real case data profiling. Without a robust and reliable algorithm, there could be the chance of false detection of steps for an accelerometer-based pedometer. A proximity sensor could be a good add-on option that can be integrated with a smart shoe to detect step counts quite in a simpler and reliable way. The proximity compensation mechanism along with motion detection by accelerometer ensures to prevent false step detection. This solution can be used for smart shoes. Any shoe

attached with this kind of solution will be smart enough to detect your step and calorie counts.

[3] This paper proposed wearable smart shoe technology for health and fitness purposes using IOT. The sensors used are interfaced with an Arduino which is responsible for sending and receiving data. Accelerometer calculates footstep count, distance travelled and total calories burned and this data is stored in Arduino and send to the android device by using a Bluetooth module embedded in the shoe. Another feature added in the shoe is the Piezoelectric device which charges USB devices when a user walks around. It also consists of a GSM safety module. Entire data received from the wearable sensors is displayed on the android device and the end-user can view and access it.

[4] The proposed smart insole solution enables a customer to capture, monitor and share the collected data through a software app connected with the insole device. The hardware system is made up of a System on Chip (SOC) on each insole connected to a variety of sensors (e.g., force, temperature, accelerometer, heart rate ,etc.), a connectivity chip, and a power management unit. Each insole has the capability to function on its own and as part of the pair. They communicate with each other as well as with the connected mobile device sending and receiving data and commands as necessary. The software system uses the information collected by each insole, computes the information, and provides feedback to the user. An interactive app is built for both iOS and Android platforms. This app gives the user access to all the detailed graphs and feedback at any time of the day. The processor on each insole interacts with the app, helping it compute the numbers, and converts them to an easy-to-read graphical format.

3. METHODOLOGY

3.1 Obstacle Detection

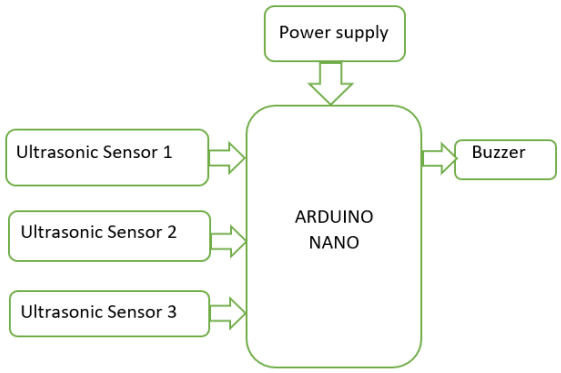

Fig -1: Obstacle Detection Block Diagram

As seen in the above diagram fig (1); 3 Ultrasonics, a Buzzer and a Power Supply are interfaced with the help of Arduino Nano. The principle of the ultrasonic sensor is that the ultrasonic sensor has 2 parts one is the transmitter and the other is a receiver. The ultrasonic sensor transmits sound pulses at regular intervals. These propagate in the air at the velocity of sound. If they strike object pulses are reflected back as echoes to the receiver.

Typically, an Arduino is used for communication with an ultrasonic sensor. To begin measuring the distance the Arduino sends a trigger signal to the ultrasonic sensor, a duty cycle of which is 10 microseconds for the used sensor. When triggered, the ultrasonic sensor generates 8 acoustics wave bursts and initiates a time counter. As soon as the reflected signal is received timer stops. The output of the ultrasonic sensor is a high pulse with the same duration as the time difference between the transmitted ultrasonic burst and the received signal. The Arduino integrates the time signal into the distance.

We will be using 3 ultrasonic sensors to increase the efficiency of the system. The use of one ultrasonic sensor does not reflect pulse if the object is slant. Hence interfacing three ultrasonic sensors with the Arduino gives the best result. The 3 sensors work linearly but not simultaneously. The first ultrasonic sensor will check for any object, if not detected then the 2nd ultrasonic sensor will work and so on. The distance assigned will be 25cm, so if any object is detected within this range then the buzzer will start buzzing and its intensity will increase as the object comes closer.

3.2 Footstep Count

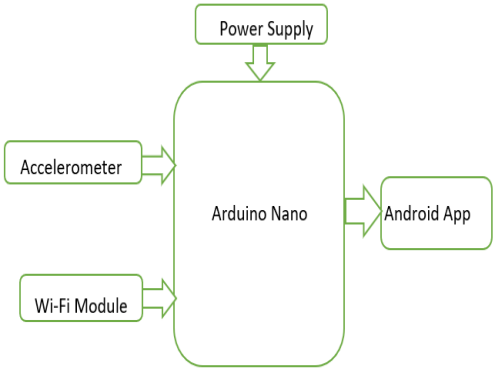

Fig -2: Footstep Count Block Diagram

Fig-2 comprises of Accelerometer, Arduino, Power Supply, Wi-Fi Module, Android App. An Accelerometer sensor is used to measure the speed and acceleration of an object. With the help of it, total steps can be calculated

and based on that the number of calories burned is notified to the user. When a suitable locomotion pattern is conceded then the accelerometer acknowledges the steps. If the foot is on the ground or at rest the activity pattern will not update until the user starts walking again. Thus, ensures no false steps would be detected. The data is stored in Arduino and transmitted through a Wi-Fi module.

Wi-Fi module is a very user-friendly and low-cost device to provide internet connectivity. The module can work both as an Access point and as a station, hence it can easily fetch data and upload it to the internet making the Internet of Things as easy as possible. The data transferred is stored on the cloud and displayed on the Android App. The activity status is then updated to the user via voice command.

4. CONCLUSION

In this paper, we discussed how we are going to embed wearable sensors on the shoes. This system is low cost and user friendly, thus attracting more customers and increasing demand for it. It is convenient for Visually Impaired People as it helps them to be resistant to accidents and maintain fitness without relying on others. The Internet has become a part of day-to-day activities. With the advent of technology, we introduced Smart Shoes using IOT and making it available to users anywhere at any time. Basically, we manifested that how wearable sensors can forward data and present it to the users in a desired way.

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