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SMART SHOES FOR BLIND AND VISUALLY IMPAIRED PEOPLE

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ABSTRACT

Mobility and navigation are both difficult for blind and visually impaired people. Their daily activities are hampered by their failure to adapt to or appropriately identify their environment, which leads to accidents, falls, and becoming lost in unfamiliar settings. The design, implementation, and validation of smart shoes will be offered in this study as an effective option for more secure movements for blind and visually impaired people.

The purpose of this system is to detect impediments, wet floors, and patient falls. If one of the aforementioned situations occurs, the user will be warned acoustically via voice alarms. In addition, a mobile phone application is designed to alert the patient's parents in the event of an emergency.

Keywords — Arduino, Internet Of Things(IoT), , Sensors, Electronics, Visually impaired.

INTRODUCTION

According to a WHO (World Health Organization) survey conducted in 2011, approximately 1% of the global population is visually impaired, with roughly 10% of them being completely blind. Blind people's main issue

People are mobile. For mobility, they must rely on others. This method provides a tool for visually challenged people.

persons who can assist them in navigating Android phones are now widely utilized by everyone. With the assistance of Android, It is necessary to create an application and a wearable gadget. Sensors and vibrators make up the system we created. for sensing the environment and informing a blind person of the location of the nearest object in the range of barriers The goal is to broaden people's perceptions. In fact, the majority of engineering tools were created to assist.

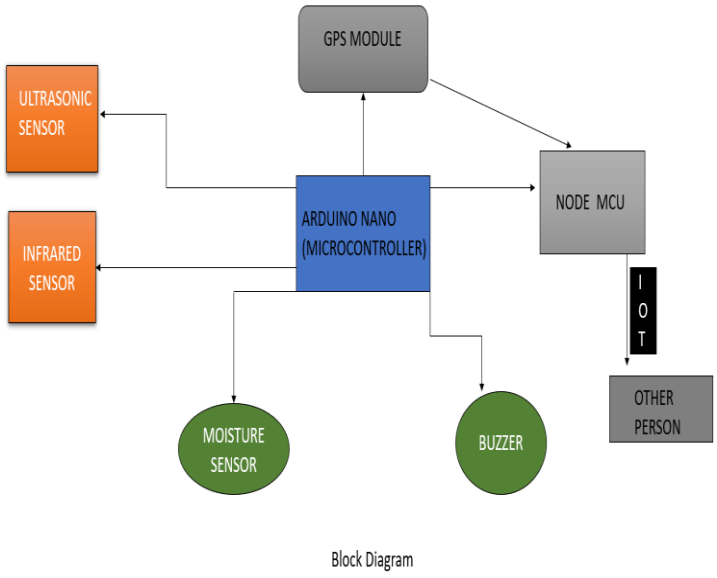
Canes are used by patients with disabilities. Despite the fact that these canes are highly advanced, they nevertheless have a number of issues. Whether their dimensions or the necessity to be, are debatable. handled on a regular basis (thus, one of the hands is no freer), the high likelihood of breaking something if you hit it difficult, the inability to recognize road humps and bumps, and so on…

As a result, the goal of this project is to manufacture low-cost, high-quality products. Smart shoes with high precision for the blind and visually challenged. This technology will be able to detect and avoid obstacles. ensure safe and secure travel both inside and outside The art is unique in that it embeds more than one image. one system with one function: Obstacle detection, wet floors and falls, as well as health-care notification providers or parents of the deaf patient's current situation and in the event of a fall

RELATED WORK

Previously, the visually impaired had trouble moving and carrying from one place to another. Some of them used to stroll about with a guide dog to help them avoid collisions. Some of them used to seek assistance from others. As a result, some developers have created solutions to help the visually impaired feel more independent. White Cane and SonicGuide are two of the most popular goods. White cane, commonly known as a "Hoover" cane after its designer, Dr. Richard Hoover. The white cane is primarily intended to be used as a mobility aid to detect obstacles in the user's path. However, there are certain drawbacks to using a cane. The following are some of the disadvantages: using a cane is difficult in a crowded restaurant, or in placing it into a car or a plane or even a bus. Because the White Cane is composed of metal, it is heavy and rigid, and it is prone to snapping or cracking. Currently conducting research and trials in order to build a ewhite cane SonicGuide is a smart head-mounted device that takes photos with a camera and analyses them with an algorithm to find abnormal items along the path, alerting the user via a linked earphone. However, this device has its own set of issues. It's hefty, and wearing a device on your head all the time can lead to neck problems and injury. It also uses a lot of electricity because the camera is constantly taking photographs. Some studies concentrate on the new Sonice Guide. Smart Shoes aren't the only walking aid accessible for visually impaired people; the Mini Guide (Sendero Group.com, 2017) and UltraCane are two more (ultracane.com, 2017). We analyzed the existing goods well enough to build one that is both superior and more efficient. Although no product is perfect, there is always the potential for development. We at Smart Shoes try to lend a helping hand to those in need. We designed a small, wearable, and hands-free device that enables users to walk with both hands. Nonetheless, we addressed the battery issue by utilizing hardware that uses less power than the other devices. The practicality and user adoption of such devices is governed by variables such as portability, low cost, and, above all, control simplicity. The Smart shoe device is a portable electronic device. As a result, it should be a tiny and lightweight gadget that is suitable for transportation. It should also be simple to operate: no complex control buttons, switches, or display panels should be there. Moreover, the device should be low-price to be used by more blind persons. Our system is designed to be portable (compact and light), connected to an Android application, simple to use, and power-efficient (battery-powered).

IMPLEMENTATION



Block Diagram

So here ,first of all we have our block diagram depicting the whole model in miniature form.

The ultrasonic sensors, an Arduino, and a vibrator/motor are all included in this shoe. If there are any obstructions or materials within 3m of the ultrasonic sensor, the sensor will deliver a signal to the individual in the form of a vibration or auditory signal. This was created to detect the barriers in the area. Provide tactile input to them

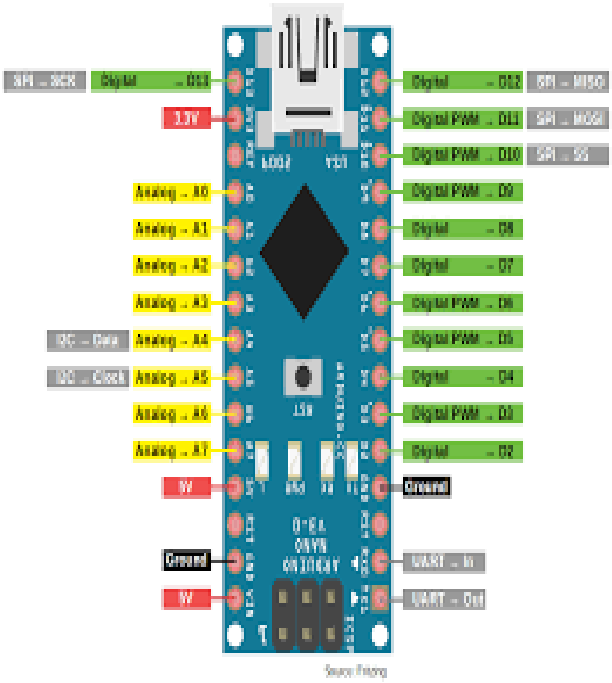
so they can avoid obstacles and determine the best course to take on.

We have other sensors also such as an infrared sensor for finding the depth and detection of a pit that comes in the direction of the person. After this, there is one moisture sensor to detect the water in case of a slippery road, but we have also added one switch to temporarily turn off this sensor. Also, we have attached a buzzer, which produces different frequency sound whenever a sensor gets activated and senses something.

After this, we have GPS Module and Wifi Module (node MCU ESP32), each having Tx and Rx connected to Arduino and to each other.

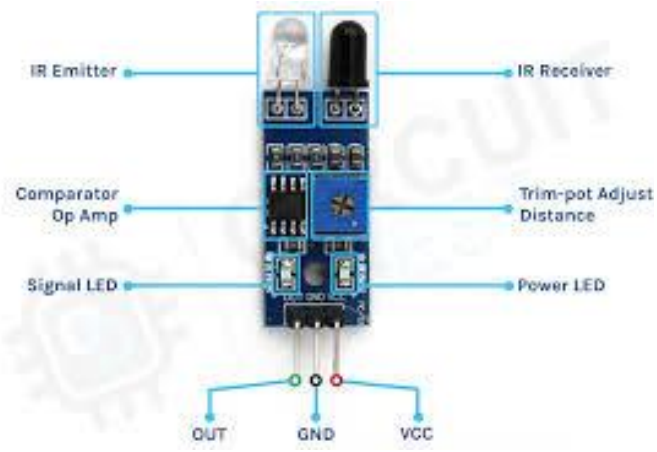
The GPS module will give different parameters of the current location. The GPS receiver calculates the distance between each satellite by the time it takes to receive a broadcast signal. The receiver can determine and show a user's position using distance measurements from a few more satellites. All this information is sent to node MCU and from there with the help of IoT, this information of GPS module and other sensors is transferred over a server which can be seen by the user having the URL of the network.

1) **Arduino Nano** :



2) **ULTRASONIC SENSOR:**

3) **IR SENSOR**



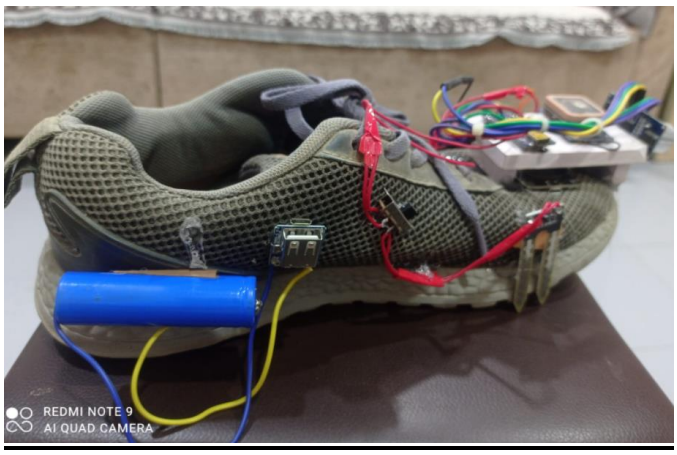
4) **MOISTURE SENSOR**

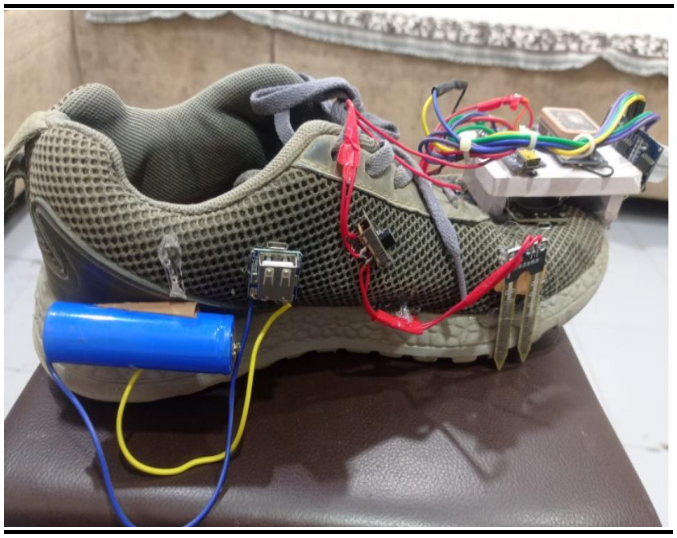
5) **BUZZER**

6) **GPS MODULE**

7) **NODE MCU**

FINAL PRODUCT:





CONCLUSIONS AND FUTURE WORKS

The suggested solution is based on an embedded system, which combines hardware and software to create a sophisticated navigational help system. This technology is primarily used for blind and visually impaired persons to detect obstacles, and damp floors, and assess their position when they fall by designing a phone application that is loaded on their parents' or health care providers' phones.

Finally, the IEC 60601 safety electronic standard was used to develop electrically safe remedies to the problems that were discovered. We were able to design a freestanding, low-cost, and electrically safe smart shoe for blind and visually impaired individuals by following a series of technical requirements that ensure the safety of electrical equipment and systems. There are many ideas that might be added to this work to improve its functionality and reduce false alerts. Other sensors that improve measurement accuracy, as well as sensors that monitor the patient's vital signs after a fall, such as heart rate sensors, will be highly recommended. Furthermore, testing this prototype on a wider population in order to detect all system flaws and improve performance in future iterations is of high importance.

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