

MEDICAL ELECTRONICS BASED SMART SHOE FOR BLIND PEOPLE

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Abstract

Power of sight is considered as the most important of all senses. Blind people are often dependent on others for their daily tour. Over time several advancements in technology has helped in increasing entertainment and comfort for the blind. "Smart shoe" can assist the blind on their daily routine and can act as a comfortable and safe companion on their journey. Common assistances provided earlier for the blind include walking sticks or guide dogs. It includes ultrasonic sensors with a step counter that can alert the person of the impending obstacles. The technology results can improve their ways of growth and can drive them to lead their independent lives. Medical assistance can be provided depending on the pattern of the walk. The electronic hardware will be fixed in shoes for users. User will wear the shoe and travel anywhere, and attached sensor will be sense obstacles near to the shoes alerts with the help of visually impaired people. India contributes about 21% of the blind people over total population.

Keywords: Smart Shoe, Blind People, Medical assistance.

1. INTRODUCTION

Blindness is a term used to signify visual impairment. The loss of vision associated with both the eyes can be total or partial. In India a person with vision 6/6 after adequate spectacle correction is considered blind as per National Programme for Control of Blindness (NPCB). As per WHO almost above 49 million people are blind. Over the decades there has been an increase in the count of blind people due to cataract, refractive errors, glaucoma etc. More technological advancements and research have been working on a cure for most of the avoidable or preventable blindness which may be caused due to cell damage in the eye. It focuses on design a smart shoe which will be able to detect and alert the blind people of the incoming obstacles in the route and also provide information regarding the exact distance and direction of the obstacle from the user. The shoe is connected via an android application to the user to provide an audio output through speakers or headphones. The shoe consists of ultrasonic sensors to detect any obstacle in the path and a step counter that can count the number of steps to the point. We believe that this smart shoe will help the blind people to have a more user friendly experience and a much cooler assistance.

People with visually impaired faced most of the challenges in the environment. The long Hoover Cane used by them is not advantages while walking and travelling. Using smart shoes for visually impaired people need not to be depending on others for mobility. The systems we have designed consist of sensors and vibrator for sensing the surrounding environment and giving feedback to the blind person. It is used as a safety device as well as navigation device. The electronic hardware will be fixed in shoes for users. User will wear the shoe and travel anywhere, and attached sensor will be sense obstacles near to the shoes alerts with the help of visually impaired people. India contributes about 21% of the blind people over total population. In a million population, there are around 53 persons that are visually impaired, 46 thousand are having low vision and around 7000 have completely lose the vision.

2. LITERATURE REVIEW

Smart Shoe for Visually Impaired This paper presents a Shoes which is integrated with ultrasonic sensors, vibration sensors and Bluetooth. These shoes can direct the user to his destination and can alert him about the impending obstacles on the path via the attached vibration sensors. The system needs to be improved as there is no provision for water detection and the components of the shoes can get damaged if it comes in contact with water. Again there is no provision for counting the number of steps to the obstacle.

Smart Navigational shoes for the blind obstacle detection This paper presents a Shoes with Sensors will detect obstacles and vibrators will vibrate according to direction. IR sensor is utilized for obstacle detection. In the project that the obstacle is distinguished out and about then buzzer will turn ON. Additionally if the water is available on street it will distinguish by water sensor lastly this information will show on LCD. However, this project needs to be modified as there no provision for counting the number of steps to the obstacle.

Advanced Shoes for blind people Advanced shoes can detect the obstacles within a particular distance with the help of ultrasonic sensors and the vibration sensors will vibrate in the direction of detected obstacle. As this project doesn't have water sensor, the shoes will get damaged in presence of water. The project doesn't have the provision to find the route to destination as there is no attached GPS and also as there is no step counter, the exact position of obstacle cannot be determined.

Wearable Obstacle Detection System for Visually Impaired People This paper presents an obstacle detection system that can alert the blind people about obstacles while travelling. The proposed system can detect the nearest obstacle via a stereoscopic sonar system and sends back a vibro-tactile feedback to inform the user about its location. The main aim of the system is to increase the mobility of visually impaired people by offering new sensing abilities. The system needs to be improved as there is no water sensor and shoes can get damaged in water, also a step counter need to be installed for locating the exact position of obstacle.

Energy Harvesting for Smart Shoes Consumer reliance on wearable electronic devices has grown significantly in the past decade. As wearable electronic devices evolve and proliferate, there will be a growing need for more power delivery to distributed points around the human body. The current approach to power distribution is clearly becoming problematic as more appliances are carried. We are forced to either use more small batteries that require replacement everywhere or run wires through our clothing to supply appliances from a central power source. A new approach, which eliminates the power wiring problem, is developing and storing electric energy at the devices themselves by scavenging waste energy from human activities. The human activity of walking is an important source of energy harvesting. According to estimations, 67 watts of power are available in the heel movement of an average (68 kg) person walking at a brisk pace. But only a few percentage of this energy is suitable for the alimentation of an electronic device. This problem is approached by using the energy from the weight transfer during a step to perform useful work. So this paper is focused on the development of an "easy to use" and "cheap general purpose" device for the storage and management of the harvested energy with particular applications on shoes.

A Shoe-Embedded Piezoelectric Energy Harvester for Wearable Sensors Wearable sensors are becoming smaller and increasingly widely used, resulting in an increasing need for independent and compact power

supplies. Electrochemical batteries, cannot meet the need because of their limited energy storage capacity and potential environmental and health risks. This has driven the development of wearable energy harvesters, which harvest the mechanical energy dissipated in human motion to provide renewable and clean energy. Piezoelectric energy harvesters and nano-triboelectric generators can convert mechanical energy into electric energy directly, thus their structures are more compact and simpler in comparison to those of other types. The mechanical energy dissipated in shoes can even power a computer, serving as an attractive energy source for wearable harvesters. This paper develops a shoe-embedded piezoelectric energy harvester, which can be integrated in a shoe readily for energy harvesting from human locomotion. Two harvester prototypes are made and tested. The first one is made up of a multilayer polyvinylidene difluoride (PVDF) film and a structure of engineering plastics, which is placed under the heel. The second one is designed as an insole shape and used as a normal insole, consisting of a structure of flexible silicone rubber and two multilayer PVDF films. In order to store the harvested energy and provide a constant DC output voltage, a power management circuit is designed.

3. EXISTING METHODOLOGY

Sticks are provided to blind as an aid to navigation. Blind people can find the obstacles on the path using sticks but always need a support for finding the path. They always rely on someone for navigation, thus Sticks are not effective. Another option is to provide blind with the guide dogs. Guide dogs are specially trained dogs for assisting the blind. These dogs are trained as per the owner requirement. However, everyone can't afford Guide dogs as they are very expensive.

Optical Device Indicating a Safe Free Path to Blind People Pathfinder using a LED and a photodiode An active optical is implemented because an electronic travel aid to improve the mobility of persons who are blind. By using radiometric calculations the protected path is optimized. Typical configurations of obstacles are studied: an opening, a side panel, a front panel, and a post of Protection zones is proposed. The results in real configurations such as parked cars, trees, and dustbins are presented too. Finally, we explain how the device which can be used in real life by visually impaired people, in conjunction with the typical white stick.

Wearable Obstacle Detection System for Visually Impaired People This paper presents an obstacle detection system to help visually impaired people. User gets alerted of nearest obstacles in range while traveling in their environment. The system we propose detects the nearest obstacle via an ultrasonic sensor system and sends back feedback to inform blind person about its location. The system aims at increasing the mobility of visually impaired by offering new sensing abilities.

4. PROPOSED SYSTEM

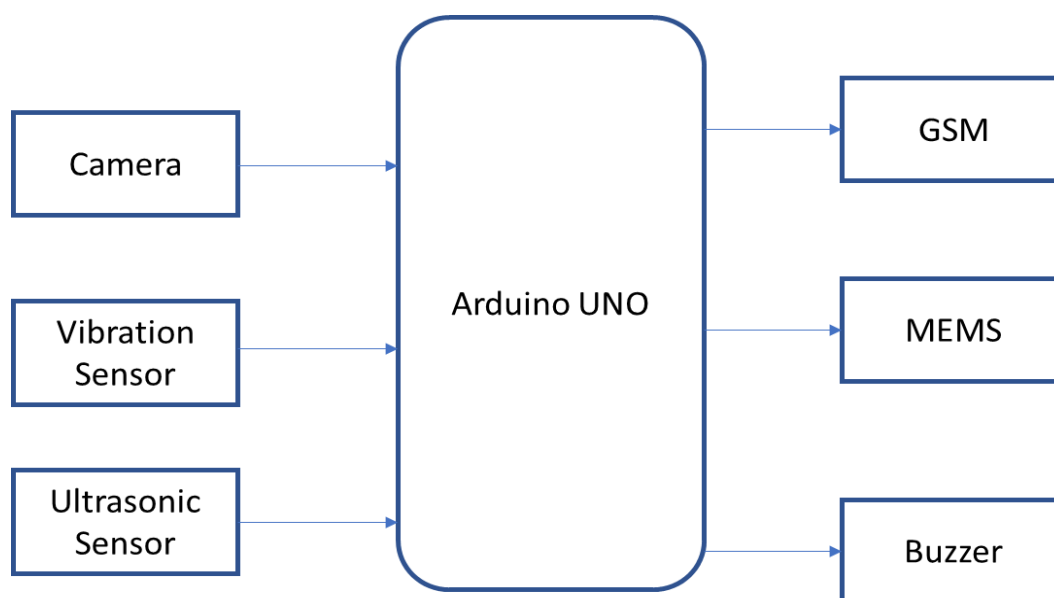
The proposed system consists of the following sections

- Sensor
- Power supply
- Controlling unit
- Output section Sensor

This paper includes ultrasonic sensors, pedometer sensor module, water sensor. The ultrasonic sensors will detect the obstacle within 3m. The water sensor will detect the presence of water, step counter will count the number of steps to the obstacle. Power Supply-A DC power supply of 12V is used in Smart shoes. Controlling unit-Arduino Uno is used in this system as Arduino boards are inexpensive, assembly of the boards are easy and can run on various operating systems. Output Section-It consist of Buzzers and Vibration motors. An android app is connected at the output section through a Bluetooth module which gives speech output to the user.

- It is an user friendly system
- Smart shoes can locate the exact position of obstacle
- It provides navigation assistance while travelling
- It helps the user to reach his destination without getting distracted
- The comparably higher accuracy and better comprehensibility , simplicity and low weight of a actuator System.
- It does not require users to hold or carry their smartphones in specific ways in order to be able to navigate properly.
- Navigation Assistance while travelling.
- Distraction-free travel.
- Automatic rerouting and alerts.
- Various User-controlled Vibration pattern.
- User friendly system.

Fig 1: Block of proposed system



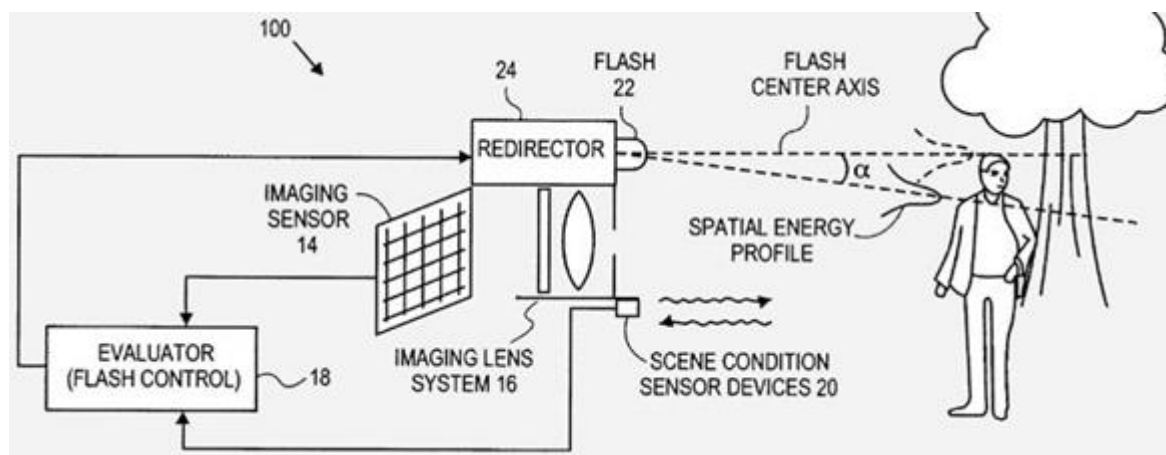
A micro-controller is a small computer on a single integrated circuit containing a processor core, memory, and programmable input/ output peripherals The important part for us is that amicro-controller contains the processor (which all computers have) and memory, and some input/output pins that you can control. (often called GPIO - General Purpose Input Output Pins).

We will be using the Arduino Uno board. This combines a micro-controller along with all of the extras to make it easy for you to build and debug your projects. The Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.. You can tinker with your UNO without worrying too much

about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

"Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.

Fig 2: Operation of proposed system



This is a relatively easy way to make circuits quickly. Breadboards are made for doing quick experiments. They are not known for keeping circuits together for a long time. When you are ready to make a project that you want to stay around for a while, you should consider an alternative method such as wire-wrapping or soldering or even making a printed circuit board (PCB). The first thing you should notice about the breadboard is all of the holes. These are broken up into 2 sets of columns and a set of rows (the rows are divided in the middle). The columns are named a, b, c, d, e, f, g, h, i, and j (from left to right). The rows are numbered 1 - 30. (from top to bottom). The columns on the edges do not have letters or numbers. The columns on the edges are connected from top to bottom inside of the breadboard to make it easy to supply power and ground. (You can think of ground as the negative side of a battery and the power as the positive side.) For this book our power will be +5 volts. Inside of the breadboard, the holes in each row are connected up to the break in the middle of the board. For Example: a1,b1,c1,d1,e1 all have a wire inside of the breadboard to connect them. Then f1, g1, h1, i1, and j1 are all connected. but a1 is not connected to f1. This may sound confusing now, but it will quickly come to make sense as we wire up circuits.

The images are actually stored as a several pixel, for every pixel in the sensor, the brightness data, represented by a number from 0 to 4095 for a 12-bit A/D converter, along with the coordinates of the location of the pixel, are stored in a file. Although the camera can record 12 bits or 4096 steps of brightness information, almost all output devices can only display 8 bits or 256 steps per color channel. The original 12-bit ($2^{12} = 4096$) input data must be converted to 8-bits ($2^8 = 256$) for output. the indicated pixel has a brightness level of 252 in the red channel, 231 in the green channel, and 217 in the blue channel. Each color's brightness can range from 0 to 255, for 256 total steps in each color channel when it is displayed on a computer monitor, or output to a desktop printer. Zero indicates pure black, and 255 indicates pure white. 256 colors each of red, green and blue may not seem like a lot, but actually it is a huge number because $256 \times 256 \times 256 =$ more than 16 million individual colors.

5. CONCLUSION

In order to make use of latest technology, we have proposed android based navigational shoes system. Wearable electronic kit is proposed. Main goal of this proposed system is to provide navigation assistance for this visually impaired person. Sensors will detect obstacles and vibrators will vibrate according direction. Right cultivator will vibrate when right swing should be taken and left shoe will vibrate when left swing should be taken. Our approach is make easy application to make visually impaired person to live independently.

The Smart Shoe for visually impaired persons is a project on embedded systems where he software and hardware were integrated each other so that to create a user friendly environment for he visually impaired persons. Sensors play a major role in this system where they were the major tools for the user guidance, due to this features it is best equipment for the visually impaired persons. Hence his project will solve the consequences faced by the visually impaired people.

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