# Smart Shoe

**Tejashree Sawadkar[1] Ojaswi Khase[2] Ranjana Shukla[3] Shruti Pandit[4] Prof. Rachana Pandey[5]**
[1,2,3,4]B.E. Student [5]Professor
[1,2,3,4,5]Department of Electronics Engineering
[1,2,3,4,5]Atharva College of Engineering

*Abstract*— This project describes an efficient methodology for aiding the blind and the visually impaired in their navigation and also people in danger. The project is basically a pair of shoes along with a mobile. It works in three modes in a domestic environment. Track manager mode in which the mobile uses navigation system through GPS and guides the user. These devices are connected to the microcontroller fitted in the shoes. It employs an obstacle detection unit using infrared sensors for the visually impaired. The third feature is the safety system in which the user, when in danger, can send its location to their guardians through impact mechanism on the shoes. The project utilizes a controller, a Bluetooth module, relay, a motor, a vibrator and a buzzer. There are also some software requirements for the development of the application and designing the PCB layout. The best advantage of this system is that it needs no additional huge device to be carried along and it also doesn't need any special training as the input output system is very simple.

***Key words:*** Smart Shoe

## I. INTRODUCTION

Mobility aids like walking stick and guide dogs are still used by the blind even today. With the advancement of technology, some different types of electronic travel aid have been developed to support the mobility of the blind. Most of the commonly used electronic travel aids use ultrasound. All such devices use the principle of reflection of the high frequency ultrasonic beam, and are available in different models. The most widely used primary mobility aid today is the long cane or a walking stick. This has several limitations such as a range limited to the length of the cane, typically one pace ahead of the user, difficulties detecting overhanging obstacles, and difficulties storing in public places. But all systems are focused on one particular problem and require the blind to carry a device along, difficulty in using, training the blind first to understand the outputs and give inputs. A sensor based shoe has been developed that helps the blind person in obstacle detection only. But it does not help them face all their navigation problems. But there is no system so far that integrates the solution to all their problems, wherever they go, considering their ease to handle it. Our project integrates different technologies and guides the visually impaired in all aspects wherever they go, be it their house, a hotel or on the street. The main advantage of it is that the person need not carry a cane or any such tool or device along. He can just wear the shoes just like others. Carrying a mobile will surely not be an additional burden like carrying a big cane along.

## II. BLOCK DIAGRAM AND EXPLANATION

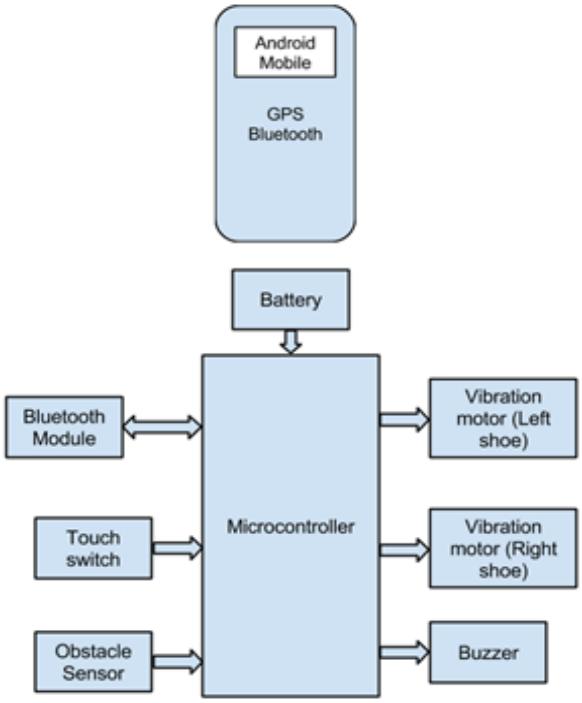

Fig. 1: Block Diagram

*A. Controller*

The controller is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard 80C51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel IC is a powerful controller which provides a highly-flexible and cost-effective solution to many embedded control applications.

It provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the IC is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM con-tents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.

*B. Bluetooth Module*

Fig. 2: Bluetooth Module

Bluetooth is a specification for a small form-factor, low-cost radio solution providing links between mobile computers, mobile phones and other portable handheld devices, and connectivity to the Internet. It will enable users to connect a wide range of computing and telecommunications devices easily and simply, without the need to buy, carry, or connect cables. It is a wireless technology that operates on an unlicensed radio spectrum. There is no charge for communicating between two Bluetooth devices. Bluetooth is intended to get around the problems that come with both infrared and cable synchronizing systems. The hardware vendors, which include Siemens, Intel, Toshiba, Motorola and Ericsson, have developed a specification for a very small radio module to be built into computer, telephone and entertainment equipment.

*C. Relay*

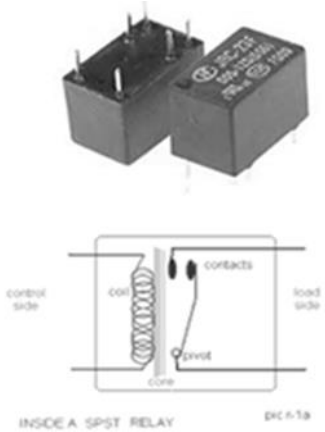


Fig. 3: Relay

A relay is an electrical switch that uses an electromagnet to move the switch from the off to on position instead of a person moving the switch. It takes a relatively small amount of power to turn on a relay but the relay can control something that draws much more power. A relay is used to control the air conditioner in your home. The AC unit probably runs off of 220VAC at around 30A. That's 6600 Watts! The coil that controls the relay may only need a few watts to pull the contacts together.

A relay switch can be divided into two parts: input and output. The input section has a coil which generates magnetic field when a small voltage from an electronic circuit is applied to it. This voltage is called the operating voltage. Commonly used relays are available in different configuration of operating voltages like 6V, 9V, 12V, 24V etc. The output section consists of contactors which connect or disconnect mechanically. In a basic relay there are three contactors: normally open (NO), normally closed (NC) and common (COM). At no input state, the COM is connected to NC. When the operating voltage is applied the relay coil gets energized and the COM changes contact to NO. Different relay configurations are available like

SPST, SPDT, DPDT etc, which have different number of changeover contacts. By using proper combination of contactors, the electrical circuit can be switched on and off.

*D. Buzzer*

Fig. 4: Buzzer

The buzzer produces sound based on reverse of the piezoelectric effect. The generation of pressure variation or strain by the application of electric potential across a piezoelectric material is the underlying principle. These buzzers can be used alert a user of an event corresponding to a switching action, counter signal or sensor input. They are also used in alarm circuits.

*E. Vibration Sensor*

The vibration sensor is used for testing the impact force. It has high vibration detection sensitivity and the environmental of sound signal suppression, which has strong ability to engage in interference.

It is consisted of piezoelectric element, spring oscillator, Sensitivity adjustment knob, and led. We can regulate the knob to adjust the sensitivity. For example when adjusting the knob clockwise, the sensitivity increases, oppositely it reduces and outputs alarm signal, led will light while testing the certain scope shock.

*F. Obstacle Sensor*

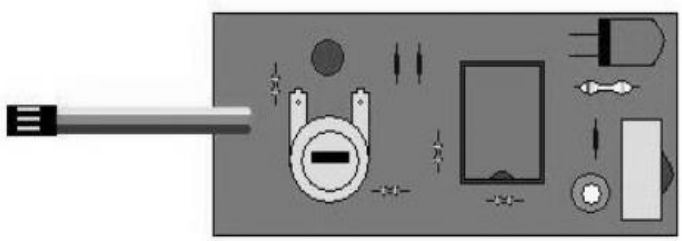

Fig. 5: Obstacle Sensor

It consists of three major components. The first is an Infra-Red (IR) transmitter (usually an IR LED), the second is a TSOP (an Infra-Red receiver) and third IC 555.The main difference between LED and IR LED is that IR LED emits Infrared Radiations, which we cannot see by our naked eyes. TSOP requires the incoming data to be modulated at a particular frequency and would ignore any other signals. It is also immune to ambient IR light. They are available for different carrier frequencies from 32 kHz to 42 kHz.

*G. DC Motor*

Fig. 6: DC Motor

In any electric motor, operation is based on simple electromagnetism. A current-carrying conductor generates a magnetic field; when this is then placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field. As you are well aware of from playing with magnets as a kid, opposite (North and South) polarities attract, while like polarities (North and North, South and South) repel. The internal configuration of a DC motor is designed to harness the magnetic interaction between a current-carrying conductor and an external magnetic field to generate rotational motion.

In real life, though, DC motors will always have more than two poles (three is a very common number). In particular, this avoids "dead spots" in the commutator. You can imagine how with our example two-pole motor, if the rotor is exactly at the middle of its rotation (perfectly aligned with the field magnets); it will get "stuck" there. Meanwhile, with a two-pole motor, there is a moment where the commutator shorts out the power supply (i.e., both brushes touch both commutator contacts simultaneously). This would be bad for the power supply, waste energy, and damage motor components as well. Yet another disadvantage of such a simple motor is that it would exhibit a high amount of torque "ripple" (the amount of torque it could produce is cyclic with the position of the rotor).

## III. FLOW OF WORKING

### *A. Navigation*

1) We are using two vibration motors. One is attached to the left shoe and the other is attached to the right shoe.
2) Design a mobile application, we trained mobile application by mentioning coordinates of location.
3) Bluetooth module connected to the shoe side circuitry will pair this Bluetooth with mobile Bluetooth.
4) Person enters the starting and destination location in mobile app.
5) Mobile app send signal to UC through Bluetooth module. UC Bluetooth module will receive signal from mobile.
6) According to that particular leg vibration motor will turn on.
7) If person select the wrong path then buzzer will turn on.

### *B. Obstacle*

An obstacle sensor will be used to sense any obstacle at the front.

### *C. Safety Feature*

A switch is used wherein if a person taps the shoe 3 times a SMS will be sent which will include the person's current location.

## IV. ADVANTAGES

1) We can determine exactly where we are at the moment.
2) Track the location on Smartphone
3) No more fear of getting lost.
4) Search nearby area and going directly there and saving time.
5) User friendly
6) Helps blind for navigation. The shoes are designed for visually impaired people to be used alongside a cane. While they cannot look out for traffic like a guide dog, the shoes buzz to indicate whether a wearer should turn left or right and can lead them to their destination

## V. FUTURE SCOPE

1) Voice recorder and speech simulator can be used for voice output
2) Power can be generated using sensors that can drive the batteries.
3) Extra features can be added in the future according to the need of the user.
4) The size and cost of the project can be minimized further by using VLSI technique
5) The shoes can also be used for the safety purpose of small children.

## VI. CONCLUSION

The proposed navigation aid has been developed in order to enhance the independent mobility of blind individuals. This system needs no additional huge device to be carried along and it also doesn't need any special training as the input output system is very simple. This system also focuses on most of the navigation problems faced by blind, within familiar indoors. Its application is widened to any new environment which makes it advantageous. The error in direction made by the user is made note of and suitable corrective steps are suggested. The projects available in the market do provide with navigation and safety features. The innovation in our project is the combination of all the individual features in one device to make it user friendly and compatible for the visually challenged people.

## REFERENCES

[1] IEEE paper on A wireless networked smart-shoe system for monitoring human locomotion http://ieeexplore.ieee.org/xpl/articleDetails.jsp?arnumber=6172017.
[2] Yuan, D.; Manduchi, R.; "Dynamic environment exploration using a virtual white cane", in Computer Vision and Pattern Recognition, 2005. CVPR 2005. IEEE Computer Society Conference.
[3] Tahat, A.A., "A wireless ranging system for the blind long-cane utilizing a smart-phone", in Telecommunications, 2009. ConTEL 2009. [3] Bolgiano, D. Meeks; "A Laser Cane for the Blind", in Quantum Electronics, IEEE Journal (2003).
[4] Zhang, J.; Lip, C.W.; Ong, S.K.; Nee, A.; "A multiple sensor-based shoe-mounted user interface designed for navigation systems for the visually impaired" in Wireless Internet Conference (WICON), 2010 The 5th Annual ICST.