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# Navigation of Path for Blind Using Ultrasonics

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**Abstract:** ***This paper describes the development of a navigation aid in order to assist blind and visually impaired people to navigate easily, safely and to detect any obstacles. The system is based on a microcontroller with synthetic speech output. In addition, it consists of two vibrators, two ultrasonic sensors mounted on the user's shoulders and another one integrated into the cane. This aid is able to give information to the blind about urban walking routes and to provide real-time information on the distance of over-hanging obstacles within six meters along the travel path ahead of the user. The suggested system consists then in sensing the surrounding environment via sonar sensors and sending vibro-tactile feedback to the user of the position of the closest obstacles in range. For the ultrasonic cane, it is used to detect any obstacle on the ground.***

**Keywords:** Sensors, Microcontroller, Vibrator, Navigation

## 1. Introduction

Mobility is one of the main problems encountered by the blind in their life. Overtime, blind and visually impaired people have used some methods and devices such as the long white cane and guide dog, to aid in mobility and to increase safe and independent travel .Due to the development of modern technologies, many different types of devices are now known as electronic travel aids. Among these aids are sonic pathfinder, Mowat –Sensor and Guide cane which are called clear path indicators or obstacle detectors since the blind can only know whether there is an obstacle in the path ahead. These devices are used to search for obstacle in front of the blind person, and they operate in a manner similar to a flashlight, which has very narrow directivity. Sonic-sensor since it has wide directivity enabling it to search for several obstacles at the same time. The purpose of this project was to create a prototype of a device that can help blind people to travel with increased independence, safety and confidence. In addition and in order to overcome the imperfections of existing electronic travel aids, the suggested method of measuring distance travelled in this system, is to use the It can supply the blind person with assistance about walking The proposed system involves a microcontroller with speech output. It is a self-contained portable electronic unit. routes by using spoken words to point out what decisions to make. In addition and in order to overcome the imperfections of existing electronic travel aids, the suggested method of measuring distance travelled in this system, is to use the acceleration of a moving body which in this case is the blind person.

An accelerometer, followed by two integrators is used to measure a distance travelled by blind. This technique is considered in inertial navigation system and suffers from drift problems caused by the double integration and offset of the accelerometer which are overcome by the footswitch. When this footswitch is closed, the acceleration and the velocity are known to be equal to zero and this can be used to apply a correction. In order to help blind travelers to navigate safely and quickly among obstacles and other hazards faced by blind pedestrians, an obstacle detection system using ultrasonic sensor and vibrators has been considered in this aid. The proposed system detects then the nearest obstacle via stereoscopic sonar system and sends back vibro-tactile feedback to inform the blind about its localization. On the other hand, an ultrasonic cane equipped with wheels is considered to detect any obstacle which may be on the ground. The system has then environment recognition and a clear path indicator functions.

Portability, low cost, and above all simplicity of controls are most important factors which govern the practicality and user acceptance of such devices. The electronic travel aid (ETA) is a kind of portable device. Hence it should be a small sized and lightweight device to be proper for portability. The blind is not able to see the display panel, control buttons, or labels. Hence the device should be easy to control. No complex, control buttons, switches and display panel should be present .Moreover, the ETA device should be low –price to used by more blind persons.

## 2. System Design Model

The aid consists of a microcontroller as a processor, an accelerometer, a footswitch, a speech analyzer or synthesizer, and hexadecimal keypad, a mode switch, three ultrasonic sensors, two vibrators and a power switch. The obstacle detection part of the system contains three ultrasonic transmitter-receivers and two vibrators. Two pairs of these ultrasonic sensors are mounted on the blind's shoulders. The other is the cane type subsystem. It is equipped with ultrasonic sensor and wheels. The user walks holding this cane in front of him like the white cane. The cane type system notifies whether any obstacle is there in middle of the direction he walks. Since the wheels are always contacted with the ground, the user can recognize the condition of ground such as depression, cavity and the stairs with his hands tactile sensation intuitively.

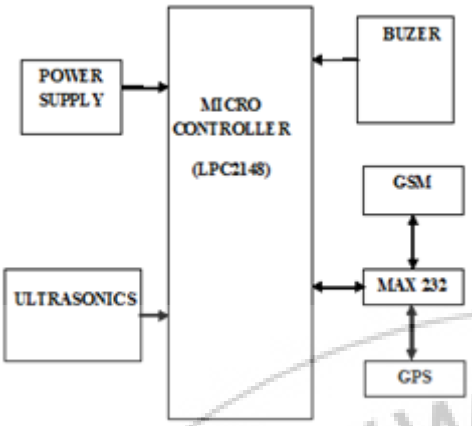


**Figure 1:** Blocks Diagram

This obstacle detection system use a 40 KHz ultrasonic signal to acquire information and can detect the presence of any obstacle within specified measurement range of approximately 0.03 to 6 meters. It operates by sending out a pulse of ultrasound. Eventually the pulse is reflected from a solid object in the path of the pulse. The time between the outgoing pulse being transmitted and its echo being received corresponds to the distance between the transmitter and the object or obstacle. This information is then relayed to the blind in some vibro-tactile way and speech way.

For obstacle detection and as aforementioned, the aid is provided with an ultrasonic system attached to the jacket an ultrasonic cane. It is based on three ultrasonic sensors and two vibrators. One of the most commonly used sensors for the detection of obstacle is PING sensor. This sensor can be used in any microcontroller even in arduino boards. The most advantageous thing about this arduino board is that these can be used using operating system. Parallax's PING ultrasonic sensor provides a very low-cost and easy method of distance measurement. This sensor is perfect for any number of applications that require you to perform measurements between moving or stationary objects. Naturally, robotics applications are very popular but you'll also find this product to be useful in security systems or as an infrared replacement if so desired. You will definitely appreciate the activity status LED and the economic use of just one I/O pin.

**a) Ultrasonic Sensor**

The sonar system is based on two ultrasonic sensors mounted together. One emits an ultrasonic wave while the other measures the echo. By differentiation of the input and output signals the PIC16F876 computes the distance to the nearest obstacle. Then this information is transmitted as a Pulse Wide Modulation signal to the receiver. The ultrasonic module used as a sensor for this application is MSU10 from Lextronic‘. Angle of detection: approximately 72 degree - Dimension: 32 * 15 * 10 mm. This technology can be used for measuring: wind speed and direction (anemometer), fullness of a tank and speed through air or water. For measuring speed or direction a device uses multiple detectors and calculates the speed from the relative distances to particulates in the air or water.

To measure the amount of liquid in a tank, the sensor measures the distance to the surface of the fluid. Further applications include: humidifiers, sonar, medical ultra sonography, burglar alarms and non-destructive testing. Systems typically use a transducer which generates sound waves in the ultrasonic range, above 18,000 hertz, by turning electrical energy into sound, then upon receiving the echo turn the sound waves into electrical energy which can be measured and displayed. The technology is limited by the shapes of surfaces and the density or consistency of the material. For example foam on the surface of a fluid in a tank could distort a reading.

**b) Vibrators**

Vibrators are used in many different industrial applications both as components and as individual pieces of equipment. Vibratory feeders and vibrating hoppers are used extensively in the food, pharmaceutical, and chemical industries to move and position bulk material or small component parts. The application of vibration working with the force of gravity can often move materials through a process more effectively than other methods. Vibration is often used to position small components so that they can be gripped mechanically by automated equipment as required for assembly etc. Vibrating screens are used to separate bulk materials in a mixture of different sized particles. For example sand, gravel, river rock and crushed rock, and other aggregates are often separated by size using vibrating screens. Vibrating compactors are used for soil compaction especially in foundations for roads, railways, and buildings. Concrete vibrators consolidate freshly poured concrete so that trapped air and excess water are released and the concrete settles firmly in place in the formwork. Improper consolidation of concrete can cause product defects, compromise the concrete strength, and produce surface blemishes such as bug holes and honeycombing. An internal concrete vibrator is a steel cylinder about the size of the handle of a baseball bat, with a hose or electrical cord attached to one end. The vibrator head is immersed in the wet concrete. External concrete vibrators attach, via a bracket or clamp system, to the concrete forms. There are a wide variety of external concrete vibrators available and some vibrator manufacturers have bracket or clamp systems designed to fit the major brands of concrete forms. External concrete vibrators are available in hydraulic, pneumatic or electric power.

Vibrating tables or shake tables are sometimes used to test products to determine or demonstrate their ability to withstand vibration. Testing of this type is commonly done in the automotive, aerospace, and defense industries. These machines are capable of producing three different types of vibration profile sine sweep, random vibration, and synthesized shock. In all three of these applications, the part under test will typically be instrumented with one or more accelerometers to measure component response to the vibration input. A sine sweep vibration profile typically starts vibrating at low frequency and increases in frequency at a set rate (measured in hertz per second or hertz per minute). The vibratory amplitude as measured in *gas* may increase or decrease as well. A sine sweep will find resonant frequencies in the part. A random vibration profile will excite different frequencies along a spectrum at different times. Significant calculation goes into making sure that all frequencies get excited to within an acceptable tolerance band. A random vibration test suite may range anywhere

from 30 seconds up to several hours. It is intended to synthesize the effect of, for example, a car driving over rough terrain or a rocket taking off. A synthesized shock pulse is a short duration high level vibration calculated as a sum of many half-sine waves covering a range of frequencies. It is intended to simulate the effects of an impact or explosion. A shock pulse test typically lasts less than a second. Vibrating tables can also be used in the packaging process in material handling industries to shake or settle a container so it can hold more product.

**c) GPS MODULE:**

Global Position System (GPS) is a space-based satellite navigation that provides location and time information in all weather conditions, anywhere on or near the Earth.GPS Receiver MT3318 Module is used that have a active patch antenna from Cirocomm. The GPS receiver tracks 51satellites simultaneously. The module is mounted on the PCB along with the 3.3V low drop voltage regulator, transmit, receive and power indication LEDs, Schmitt trigger based buffer for 5V to 3.3V logic level conversion. This GPS receiver gives data output in standard National marine electronics association (NMEA) format. The GPS receiver gives -157dBm tracking sensitivity. The module is configured at 9600 baud rate. Module requires a 5V supply and can be interfaced with the 5V TTL / CMOS logic.

**d) GSM MODULE**

Global System for Mobile communications (GSM) is the almost popular wireless standard for mobile phones in the world. GSM module allows transmission of Short message service (SMS) in TEXT mode and PDU mode. The proposed design uses SIM 300 GSM module in text mode. This design uses SIM300 GSM module that provide900/1800/1900MHz Tri-band for VOICE, SMS, DATA, and FAX. This module operates on AT command over TTL interface. AT command is an abbreviation for Attention command that is recognized by GSM Module. This abbreviation is always used to start a command line to be send from TE (Terminal Equipment) to TA (Terminal Adaptor).The information contains information speed, position (longitude, latitude), identity and temperature of a vehicle that is transmitted to the monitoring station by the SMS through the GSM network.. SIM 300 Module works on 12V, 2A power supply. The module is configured at 9600 baud rate.

## 3. Experimental Results

The obstacle detection part of the system contains three ultrasonic transmitter-receivers and two vibrators. Two pairs of these ultrasonic sensors are mounted on the blind‘s shoulders. The other is the cane type subsystem. It is equipped with ultrasonic sensor and wheels. The user walks holding this cane in front of him like the white cane. The cane type system notifies whether any obstacle is there in middle of the direction he walks. Since the wheels are always contacted with the ground, the user can recognize the condition of ground such as depression, cavity and the stairs with his hands tactile sensation intuitively.

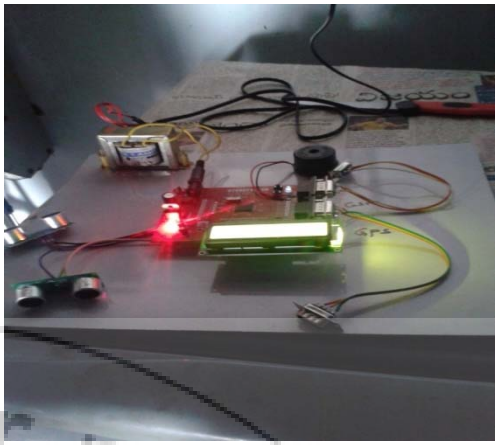

**Figure 2:** Experimental kit

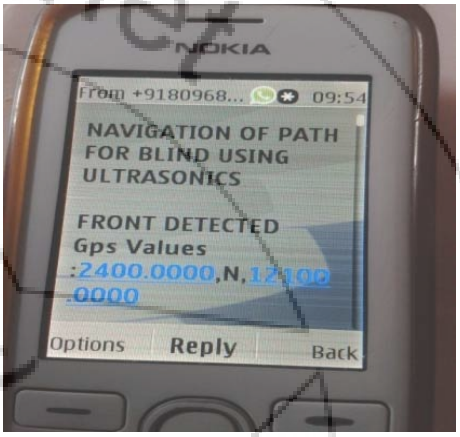


**Figure 3:** Output displayed for mobile

## 4. Conclusion

The proposed navigation aid has been developed in order to enhance the independent mobility of blind individuals. This system also focuses on most of the navigation problems faced by blind n indoor as well as outdoor. This proposal will make blind people to open their eyes by closing it. To conclude, we would like to say that engineering does not just stop at gaining knowledge and innovating, it ends when you are able to use that knowledge for the benefit of your fellow human beings. As the saying goes, ―If engineering is the application of science for human benefit, then the engineer must be a student of not only the application of science but of human benefit as well.

## References

[1] 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.
[2] 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,
[5] M, Bousbia Salah A.larbi and M.Bedda ―An approach for the measurement of impaired people‖ in proc 10th IEEE International Conference on Electronic Circuits and Systems.

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