SMART VIBRATING BAND TO INTIMATE OBSTACLE FOR VISUALLY IMPAIRED

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INTRODUCTION:
A typical walking stick is used by moving the stick from side to side by detecting objects through feel. Guide dogs are trained to lead their owners around obstacles. The sonar walking sticks can detect the obstacles without any constant movement of the stick. Throughout an average day a typical person will encounter many obstacles. Some typical obstacles encountered might include: hanging signs, tree branches, light poles, fire hydrants, people, curbs, furniture and stairs.

The main problem with white cane is that users must be trained in its use for more than 100 hours; in addition, the white cane requires the user to actively scan the small area ahead of them. The white cane is also not suited for detecting potentially dangerous obstacles at head level. Guide dogs require extensive training, and they are only useful for about five years. Although the dogs can be trained to navigate various obstacles, they are partially (red–green) colorblind and are not capable of interpreting street signals. The human half of the guide dog team does the directing, based upon skills acquired through previous mobility training. The handler might be likened to an aircraft's navigator, who must know how to get from one place to another, and the dog is the pilot, who gets them there safely. Furthermore, many visually impaired people are elderly and find it difficult to care appropriately for another living being. In order to overcome the imperfections of existing electronic and mechanical travel aids, a solution is proposed to constantly monitor a blind and alert him of the obstacles even when he is not conscious about it.

The idea of this study is to design sensor band with vibrating alert feature that can detect obstacles within the designed range (150 cm) (the average person can cover 10 ft in about four steps, this allows for sufficient time for the user to avoid obstacles) also, 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.

OBJECTIVE:
There are a millions blind persons around the world, and Many of these persons use the white cane which is the most successful and widely used travel aid for the blind. White cane is purely mechanical device used to detect obstacles on the ground, uneven surfaces, holes, steps, and other hazards. Guide dogs are very capable guides for the blind, but they
require extensive training. Furthermore, many visually impaired people are elderly and find it difficult to care appropriately for another living being. Hence we are working on a navigating tool for visually impaired with a sensor device with vibration alert characteristics. Thus it helps in constantly monitoring the surroundings of the blind person and alerts him of the obstacles ahead even without his consciousness.

**LITERATURE SURVEY:**

1. Mohd Helmy Abd Wahab, Amirul A. Talib, Herda watie A. Kadir, Ayob Johari, A. Noraziah, Roslina M. Sidek, Ariffin A proposed “Smart cane: assistive cane for visually impaired people”, IJCSI, Vol.8 Issue 4, in July 2011. This paper reports on a study that helps visually impaired people to work confidently. The study hypothesizes that a smart cane that alerts visually impaired people over obstacles in front could help them in walking with less accident.

2. Authors G. Gayatri, M. Vishnupriya, R. Nandhini, Ms. M Banupriya proposed “smart walking stick for visually impaired”, IJCSI, Vol.3 Issue 3, in March 2014. This paper was submitted on the 17th February 2014. This helps those people to walk more confidently. The study hypothesizes a smart walking stick that alerts visually impaired people over obstacles. In this system ultrasonic sensors, pit sensors, water sensor, GPS receiver, level converter, vibrator are used.

3. M, Bousbia Salah A. larbi and M. Bedda suggested an approach for the measurement of impaired people in Proc 10th IEEE International Conference on Electronic Circuits and Systems. 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.

4. Lise A. Johnson and Charles M. Higgins in “A Navigation Aid for the Blind Using Tactile-Visual Sensory Substitution” proposed the objective of this study is to improve the quality of life for the visually impaired by restoring their ability to self-navigate.


**DESIGN METHODOLOGY:**

![Basic block diagram](image)

Figure 1 shows the block diagram of our design in which the ultrasonic sensor provides an input to microcontroller when there is an obstacle and there is a vibration produced in the motor as the microcontroller output.

1. **Ultrasonic sensor**

   Ultra sonic sensor suit the best for this project as it can detect any object that lies on the ground, situated a distance of certain meters from the user. The sensor will then detect the
presence of any object that lies within that meters by detecting the reflected sound beam. The
time intervals at which the transmitter will transmit ultrasound depend on the walking speed
of the user. Also it is low cost, and efficient. Here we use HC-SR04 series ultrasonic sensor.

2. Microcontroller chip
Both the sensors and the vibration interface would be controlled through
microcontroller. One of the biggest microcontroller names in the market is the Arduino
family, with over 20 different board models. To meet the design spec of being lightweight and
portable, the Arduino Mini Pro was chosen. This model is small and lightweight, while still
operating at a frequency of 16 MHz to provide timely feedback to the user. CMOS batteries of
5v are used in the system; all the components require 5v supply for the working of the system.
They are portable, light, and less expensive.

3. Vibrating motor
To determine how the device would alert the user the proximity of objects first, audio
signals were considered. However, an audio signal would be difficult to hear in a loud area
and cause confusion to the user. A good alternative to audio signals would be a vibrating
interface. The vibration interface would indicate to the user the proximity of an object with
different vibration intensities and speeds. In addition to being a much more discrete way to
notify the user, it is also much more cost effective.

4. Software
Arduino IDE is the software that is used to develop the source code of the
microcontroller. It is chosen because it is widely used and the language is easy to understand.
It is compatible for various kinds of microchip development system tools. FTDI DRIVER is
used for connecting Arduino software to the system.

FLOW OF THE DESIGN
The figure 2 shows the flow of the operation. The design consists of a microcontroller
chip (Arduino mini pro) that is interfaced with the sensor. The sensor is programmed in such a
way that it, if there is an obstacle in the circumference of 10feet then the sensor senses and
intimates the microcontroller chip. The code is written in such a way that if the obstacle
appears from front then the vibrator vibrates once, if it appears from back then it vibrates
twice hence in a similar manner according to the direction the vibrator intimates the visually
impaired accordingly with the programmed number of vibrations, which is shown in the
flowchart.
RESULTS:
The two eyed component is ultrasonic sensor, that is interfaced to the microcontroller (Arduino) chip with vibrating motor. When the sensor senses the obstacle in the circumference of 10 ft the vibrating motor intimates the person with different number of vibrations with respect to the direction from where the obstacle originates.

Fig 3: Our Design Prototype
CONCLUSION:

With the proposed architecture, if constructed with at most accuracy, the blind people will able to move from one place to another without others help. The band sends and receives ultra sonic waves. The reflections of these waves help the user navigate around obstacles in their pathway. A vibrator pad on the band will vibrate with different frequencies and intensity depending on where the object is located relative to the user. Also the design is reliable and cost effects.

SCOPE FOR FUTURE WORK:

GPS technology can also be implemented in this system for navigating and mapping. Also audio signals can be implemented with a bluetooth headset and the batteries can be replaced with small solar cells.

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