Walking Stick with OPCFD System

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Abstract

The visually impaired have to face many challenges in their daily life. The problem gets worse when there is an obstacle in front of them. They feel difficulties Blind stick is an innovative stick designed for visually disabled people for improved navigation. To overcome all these problems of blind people, we are developing a walking cane with OPCFD system by using simple available technologies. OPCFD system which means it can detect obstacles, pits, ceilings and fire. This walking stick for blind people has multiple sensors, with the help of which it has been possible to enhance more features to the walking stick. The features are to detect the obstacle for collision avoidance, it detects the object in directions up, down and front. The other sensor placed near to the tip of the walking cane to find the pits on the ground. Temperature sensor to detect temperature of the surroundings and wheel with generator connected to end of the walking cane while walking due to the rotation of the wheel it produces some current. In this project, sensors play a key role to detect the objects in all directions and thus help blind people to be independent.

Keywords- Walking Stick, Ultrasonic Sensors, Atmega Microcontroller, Temperature Sensors, Vibration Output

I. INTRODUCTION

We can see several numbers of people around us which are visually impaired, and among them millions of people are blind and there are thousands of people those who are irreversibly blind. For blind people, performing daily activities is a difficult task since vision plays a central role in almost every activity of ours. It is not possible to search an object in an unknown place or surroundings without having the eye sight. There can be found different technologies such as ultrasonic sound based, IR based, and vision based technologies which was useful for the blind persons. Our walking stick helps the blind people in moving and allowing them to perform their work easily and comfortably.

In normal walking stick, the detection of the obstacle is done by using the sensor. But it is not efficient in the case of a blind person. Because the blind person can’t able to know what type of things or objects come in front of him and what is the size of that object and how much far is he from that obstacle. So it is difficult for a blind person to move from one place to another. But in our walking stick for blind, the output produces in the form of sound. The walking stick contain three ultrasonic sensors. One is placed on top angled based and second is in the middle and another placed in bottom ground based. The Stick measures the distance between the objects and Walking Stick by using an Ultrasonic sensor. When any objects or obstacles come in range of an ultrasonic sensor then the vibrator vibrates depend upon the obstacle which is in front of the stick. Our stick also contain temperature sensor to detect the fire zone. It allows the user to walk freely and independently by detecting the obstacles. The obstacles can be detected by using various techniques. The obstacles will be sensed using a sensors and the sensor is connected to the atmega microcontroller chip. Each sensor output separately connected to mobile vibrators. If any objects or obstacle comes in front of the blind person, he will get the information about the obstacle by sensing the vibration which was generated by the mobile vibrator connected near to handle of the stick. Totally in our walking stick we use four mobile vibrators for three ultrasonic sensors and one temperature sensor. The walking stick for blind is a simple and purely mechanical device to detect the obstacles on the ground. This device is less in weight and portable. But its range is limited due to its own size. It provides the best travel aid for the blind. Our aim of this project is to design a walking stick which is very much useful for those people who are visually impaired and are often need help from others. There is a lots of technologies can be used to reduce different barriers that a blind person has to face. These kinds of the technologies are commonly referred to as assistive technology. It give a free and confidential walk.
II. AUTHOR GUIDELINE FOR MANUSCRIPT PREPARATION

In normally we can search in google and find there is a lot of cool gadgets like Assist vision smart glasses developed by oxford university team. This smart glasses contain 3dimensional cameras develop a contrast image for blind people by application of software’s. It gives an output of high contrast image of the near object. But it was very costly around hundred pounds. So we planned to design a walking stick with some automation in walking stick by placing sensor and using vibrators. Number of walking stick project developed by scholars and researchers. But they have some disadvantages like unable to detect highly temperature surfaces, water bodies and ceilings. Many of this projects done by image sensing processing and voice recognition process like go right and left. Some of them connected with google maps and others can easily find where they are. In our walking stick all features are added and light weighted too.

A. OPFCD System

OPFCD system is defined as Obstacles, Pits, Fire and ceiling Detection system. OPFCD system is special feature of our walking stick.

III. SENSORS PLACEMENT AND PSEUDO CODE

Our walking stick contain three sensors. Top sensor is placed based on angled based. The 45 degree is the suitable angle to measure the obstacles over head the users like tree branches and ceiling.

Fig. 1: sensor is placed on 45 degree angle

Depending upon the programming the range detections of the obstacle can be varied. For example if we programmed for 16cm, top ultrasonic sensor detect the obstacle in range of 16cm only. It may be change depends upon the accuracy of the sensors. In our walking stick range of the top, middle and bottom ultrasonic have the range 60, 60 and 20cm. We done this project with Atmega microcontroller chip.

Fig. 2: Range detections of the obstacle

Here top ultrasonic sensor have a range of 60cm, time = distance * speed of sound

\[ t = \frac{s}{v} = \frac{60}{340} = 0.176 \mu s \]

\[ s = t \times 0.034 / 2 \]

\[ s = 0.176 \times 0.034 / 2 \]

\[ s = 0.032 \mu s \]
Fig. 3: Control unit connections

Fig. 4: Bottom sensor

Fig. 5: walking stick with OPCFD system

Table 1: Cost of the project

<table>
<thead>
<tr>
<th>SR.NO</th>
<th>Component name</th>
<th>Specifications</th>
<th>Quantity</th>
<th>Cost in rupees</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Ultrasonic sensor</td>
<td>HSR04</td>
<td>3</td>
<td>360</td>
</tr>
<tr>
<td>2.</td>
<td>Temperature sensor</td>
<td>LM 35</td>
<td>1</td>
<td>120</td>
</tr>
<tr>
<td>3.</td>
<td>Jumpers wires</td>
<td>Male-Male, Female-Female, Female-Male</td>
<td>Each 40 pieces</td>
<td>400</td>
</tr>
<tr>
<td>4.</td>
<td>Arduino uno</td>
<td>UNO</td>
<td>1</td>
<td>450</td>
</tr>
</tbody>
</table>
IV. BLOCK DIAGRAM

A. Block Diagram

In this system the ultrasonic sensor are used to sense the obstacle (if there is any). The signal is then send to microcontroller to operate a mobile vibrator. There is one more advantage of this system. Here deaf people also knowing the presence of obstacle by vibrating sensation of mobile vibrator.

B. Components Details

Authors can submit their figure with their sub topic also.

1) Ultrasonic Sensor
- Work on a principle similar to radar or sonar which evaluate attributes of a target by interpreting the echoes from radio or sound waves respectively.
- Generate high frequency sound waves and evaluate the echo which is received back by the sensor.
- Sensors calculate the time interval between sending the signal and receiving the echo to determine the distance to an object.
- This technology can be used for measuring: wind speed and direction (anemometer), fullness of a tank and speed through air or water

2) Arduino uno
- Arduino uno is a microcontroller board based on the Atmega 328P.
- It has 14 digital input/output pins.
- Out of 14 digital pins 6 can be used as PWM outputs and 6 analog inputs.
- 16 MHz quartz crystal, USB connection and a power jack, and ICSP header and a reset button.
- It contains everything needed to support the microcontroller, simply connect it to a computer with USB cable or power it with an AC-to-DC adapter or battery to get started.
- Microcontroller (ATMEGA328) a microcontroller (sometimes abbreviated µC, uC or MCU) is a small computer on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals.

3) Mobile Vibrator
- When Input is electrical signal send by microcontroller
- Give output vibration
- Easily sensible by the user
4) **Temperature Sensor (LM35)**
- LM35 series are precision integrated-circuit temperature sensors.
- Output voltage is linearly proportional to the Celsius (Centigrade) temperature.
- Linear + 10.0 mV/°C scale factor n.
- 0.5°C accuracy guaranteed (at +25°C).
- Rated for full −55° to +150°C range.
- Low cost due to wafer-level trimming.
- Operates from 4 to 30 volts.
- Low self-heating, 0.08°C in still air.
- Suitable for remote applications.

V. **Conclusions**

The main aim of our project is to design an intelligent stick that aids blind as well as deaf people for any kind of obstacle detection including water, potholes, and fire zones. If it developed with at most accuracy, the blind people will be able to move from one place to another without others help. Our prototype gives good results in detecting obstacles paced at distance in front of the user and also the obstacles which are on the sides. Our project meets all the goals and give a confidential walk for blind people without others guidance.

VI. **Future Scope**

The project can be supplemented with actual GPS MODULE used in cars and we can provide a vibrator for the partially deaf person. It can be modified to compact by using VLSI technology to design the PCB unit. Increase the range detection and battery life. All these things make the stick heavy so reduce the weight.

**References**