3rd Eye – An Ultrasonic Stick With Intelligent Voice Assistance And Object Finding For Visually Impaired People

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Abstract - The proposed work aims for the betterment of the visually impaired people by helping them to perform their basic needs independently. The Ultrasonic Blind Stick comes with a built-in voice assistant through which the users can perform actions like making a phone call, knowing the time, current weather, setting reminders etc. The stick also comes with a built in GPS system. This can be used by the blind person to transmit their location to a predefined mobile number at the press of a button. This can also be used to track the stick in case it gets lost. The stick detects the objects at a distance and warns the user that they are approaching an object. The stick also identifies the object as the user goes near to the object and informs the user what the object is. A voice assistant system is developed. This system converts voice into text. Recognition of voice varies due to dictionary size and the type of speech. The system should extract the features and should be trained to find the correct words. Another aim of the proposed work is to detect the object and informing the blind person using deep learning algorithm technique. For every object there will be a value generated which compares it to a predefined set of values and checks similar values. Once the value matches, output will be displayed in such a way that it indicates the object name and the deduction percentage of the object.

Keywords - IoT, Smart blind stick, Voice recognition, GPS.

1. Introduction

Figure 1, shows the block diagram for the proposed system. An ultrasonic proximity sensor and humidity sensor is attached to the stick [1]. Ultrasonic sensor is used to detect the objects in the path. Humidity sensor [2] is used to check moisture and water presence. 3rd EYE (blind stick) is used to make calls and send messages with the help of voice assistant. When the stick is lost, it can be found by the help of an alerting system (GPS). Vibrators have been used for producing the vibrations in the stick [3].

2. Proposed System

Figure 2, shows the circuit diagram of proposed system. Arduino has 13 digital pins and 6 analog pins. HC - SR04 trigger pin is given to 7th pin and echo pin to 6th pin of Arduino. IR sensor provides digital input to the Arduino [4]. It has three pins Vcc, Gnd and output pin. Vcc is connected to 5v, Gnd of IR sensor is connected to Gnd of the Arduino board, and output pin is connected to the digital input pin 8. LED is connected to digital output pin 5. Figure 3 shows the prototype of the Ultrasonic Blind Stick.
Voice Assistant

The following Figure 4, gives a brief idea about the Voice assistant system [8].

Graphical user interface is used to interact with the user. A voice assistant system is developed to recognize the voice. This system converts voice into text [5]. Recognition of voice vary based on the dictionary size and the type of speech. The system should extract the features and should be trained to find the correct words [6]. A text-to-speech system converts words into voice. The voice can be generated by combining parts of speeches stored in a dictionary. The system accepts the input from the user and converts into text and decides either text message has to be sent or voice call has to be made.

Object Finding

Figure 5, represents the block diagram of object finding. Preprocessing converts the color image to a gray scale image and also resizes the input image to 300 * 300. Object detection is used to detect objects, facial recognition, tracking a target and feature extraction. Classification is used to find the type of the detected objects in the predefined classes.

3. Algorithm Description

The aim of our proposed work is to detect the object for the blind person using deep learning algorithm technique. Figure 6, shows the flowchart for the proposed work. For every object there will be a value generated which compares it to a predefined set of values and checks similar values. Once the value matches, output will be displayed in such a way that it indicates the object name and the deduction percentage of the object [7]. This will be achieved in such a way that, every object will be detected and classified. A value will be generated for the object and compared with predefined values.

For every object, 400 sample images of that particular image will be taken and trained by using Convolution Neural Network technique [8], so that there will be a value generated for each and every object by comparing all sample images, once the camera detects the object in real time deep learning splits the detected image into smaller divisions and by transform methods a value will be generated. This value will be compared with the sample image’s value and there will be percentage match for that particular object will also be calculated. To indicate blind person regarding the detected object, we implement an algorithm which converts text to voice and the message will be conveyed by voice [9].

4. Simulation Results

Every object will possess a value which is generated by comparing with lots of similar objects and that value will be stored in dataset. While we compare the real time objects, there will be matching of the values in dataset, in that case the
objects will be detected along with percentage deduction of that object [10].

The image in the Figure 7, depicts that a bottle has been recognized by comparing with dataset values and it also shows the percentage deduction of bottle.

**Fig. 7: Output 1**

The image in the Figure 8, depicts that a TV monitor has been recognized by comparing with dataset values and it also shows the percentage of detection of TV monitor. Table 1 shows the comparison between Deducted Percentage and Undeducted Percentage of bottle, TV monitor and potted plant.

**Fig 8: Output 2**

<table>
<thead>
<tr>
<th>Name of The Object</th>
<th>Deducted Percentage (%)</th>
<th>Undeducted Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bottle</td>
<td>86.06</td>
<td>13.94</td>
</tr>
<tr>
<td>TV Monitor</td>
<td>78.88</td>
<td>21.12</td>
</tr>
<tr>
<td>Potted Plant</td>
<td>99.6</td>
<td>0.4</td>
</tr>
</tbody>
</table>

**Table 1: Comparison Table**

5. **Conclusion**

Voice assistant system improves the detection of voice and generation of commands as well as from text to voice synthesis. Secondly, it supports processing of more words in the same. Voice assistant system improves human machine interfacing. Object detection helps the visually impaired to accurately recognize the objects. The algorithm can be further modified to improve the percentage of detection.

**References**


