

A SMART WALKING STICK FOR VISUALLY IMPAIRED PERSON

Project Review

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May 2019

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- Conclusion
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Introduction

- There are number of blind people in the society, who are suffering while exercising the basic things of daily life and that could put lives at risk while travelling.
- There is a necessity these days to provide security and safety to such people.
- Blindness or visual impairment is a condition that affects many people around the world. Worldwide there are millions of people who are visually impaired, where many of them are blind.
- The need for assistive devices was and will be continuous.
- There is a wide range of systems and tools existing for visually impaired individuals.
- The blind person truly requires an identifying objects.

Problem Statement

- To make a smart stick which can help blind people in navigation.
- Minimizing its maintenance and operating cost.
- To achieve maximum efficiency and make it easy for the blind people.

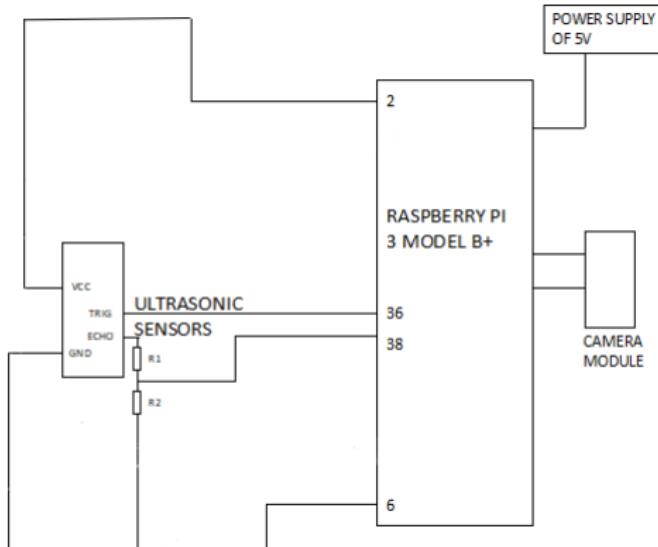
Existing System

- Blind people generally use either the typical white cane or the guide dog to travel.
- Although the white stick gives a warning about few meters before the obstacle, for a normal walking speed , the time to react is very short.
- The idea of designing and manufacturing ultrasonic sensor combines the properties of sound monition and that benefit the blind.
- Sensor can detect obstacles within the designed range to avoid the blind person through the issuance of distinctive sound.
- The existing system doesn't provide proper results and is not much effective.

Proposed Work

- The system is intended to provide artificial vision and object detection.
- System consists of ultrasonic sensors, Camera module, and the feedback is received through audio.
- Voice output works through TTS (text to speech).
- Proposed system detects an object around them and sends feedback in the form of speech that is warning messages via earphone.
- Aim of the overall system is to provide a low cost, efficient navigation and obstacle detection aid for blind which gives a sense of artificial vision by providing information about the environmental scenario of static and dynamic object around them, so that they can walk independently.

Circuit Diagram of Proposed System



Working and Formulae-Ultrasonic Sensor

- Ultrasonic module starts the process when the user turns on the device using power supply.
- Firstly when the device turns on, the ultrasonic sensor will automatically gives the distance measurement of the obstacle infront of the blind, and then the distance measured is stored in the SD card.
- Formulae Used :
 $\text{Distance} = \text{Speed} * \text{Time}/2$
Speed of sound at sea level = 343 m/s or 34300 cm/s
Thus, Distance = $17150 * \text{Time}$ (unit cm)
- Calculation of Resistor values :
 $V_{in}=5v$
 $V_{out}=V_{in}(R_2/(R_1+R_2))=3.3v$
Let $R_2=1kohm$
This gives, $R_1=515ohm$.
So, we can use the nearest to this value, we used 580ohm.
- We connected the camera and captured the image and done the colour changing and identifying object.

Working and Formulae-Camera Module

This is divided into two parts :

- 1.Text Processing
- 2.Voice Through Earphones

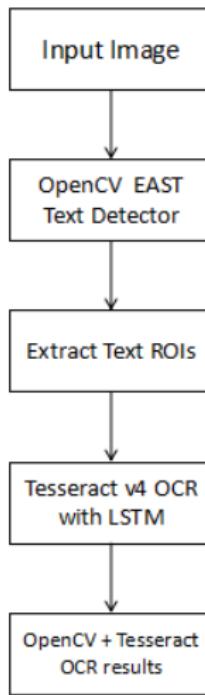
1.Text Processing

- For doing the text processing we need to perform Opencv OCR Text recognition with tesseract. This process is done in two parts :
 1. To detect text from all natural images what we take can be done by use of a highly accurate deep learning method of text detection using OpenCV EAST text detector.
 2. From above step the text regions can be identified using which we can find out ROIs which will be passed into tesseract from which the text can be extracted.

2.Voice Through Earphone

- The normal language text is converted into speech by using text-to-speech (TTS).
- There are many modules for TTS of which we used espeak.eSpeak is a compact open source software speech synthesizer for English and other languages.

OpenCV OCR Pipeline



Hardware Circuit of Proposed System



Output-Distance Measured

```
File Edit Shell Debug Options Window Help
Python 3.5.3 (default, Sep 27 2018, 17:25:39)
[GCC 6.3.0 20170516] on linux
Type "copyright", "credits" or "license()" for more information.
>>>
=====
RESTART: /home/pi/dist.py =====
Distance = 218.5 cm
Distance = 206.8 cm
Distance = 217.3 cm
Distance = 6.3 cm
Distance = 15.1 cm
Distance = 206.5 cm
Distance = 206.5 cm
Distance = 204.8 cm
Distance = 216.8 cm

=====
RESTART: /home/pi/dist.py =====
Warning (from warnings module):
  File "/home/pi/dist.py", line 9
    GPIO.setup(TRIG,GPIO.OUT)
RuntimeWarning: This channel is already in use, continuing anyway. Use GPIO.setwarnings(False) to disable warnings.
Distance = 206.5 cm
Distance = 9.2 cm
Distance = 2.7 cm
Distance = 10.8 cm
Distance = 205.5 cm
Distance = 217.5 cm
```

Fig1:Output Showing Distance Measurement

Using the above measured distance we fixed a case for distance less than 1 meter for which we used the voice command where it says "Obstacle ahead at 15cm"

Output-Image to Text

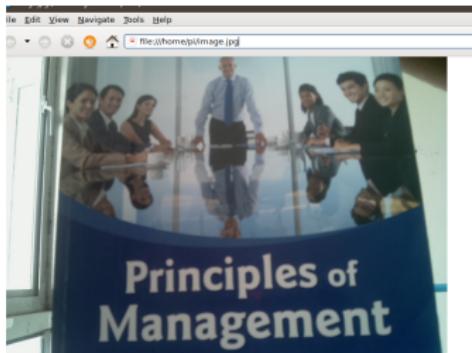
Example-1 :



```
[INFO] loading EAST text detector...
OCR TEXT
=====
Think
ALSA lib pcm.c:2495:(snd_pcm_open_noupdate) Unknown PCM cards.pcm.front
ALSA lib pcm.c:2495:(snd_pcm_open_noupdate) Unknown PCM cards.pcm.rear
JackShmReadWritePtr::~JackShmReadWritePtr - Init not done for -1, skipping unk
OCR TEXT
=====
Innovate
ALSA lib pcm.c:2495:(snd_pcm_open_noupdate) Unknown PCM cards.pcm.front
ALSA lib pcm.c:2495:(snd_pcm_open_noupdate) Unknown PCM cards.pcm.rear
JackShmReadWritePtr::~JackShmReadWritePtr - Init not done for -1, skipping unk
OCR TEXT
=====
Fabricate
ALSA lib pcm.c:2495:(snd_pcm_open_noupdate) Unknown PCM cards.pcm.front
ALSA lib pcm.c:2495:(snd_pcm_open_noupdate) Unknown PCM cards.pcm.rear
```

Output-Image to Text

Example-2 :



```
[k
OCR TEXT
=====
Principles

ALSA lib pcm.c:2495:(snd_pcm_open_noupdate) Unknown PCM cards.pcm.front
JackShmReadWritePtr::=JackShmReadWritePtr - Init not done for -1, skipping unlock
[k
OCR TEXT
=====
Management

ALSA lib pcm.c:2495:(snd_pcm_open_noupdate) Unknown PCM cards.pcm.front
```

Conclusion

- The project “Smart Walking Stick for Visually Impaired Person” is designed to create a system using Ultrasonic sensors, Camera module and providing Voice command through headphone to the blind people.
- The proposed system tries to eliminate the faults in the previous system.
- It aims to solve the problems faced by the blind people in their daily life. The system also takes measures to ensure their safety.
- The design Smart Stick for Blind using ultrasonic sensors and Camera module with voice output is of great benefit to blind people when it comes to independent mobility.

Future Work

- This prototype can be extended to work on the image processing where the output can be directly said whether in the picture it is a car/bus/house etc.
- This prototype can be extended to add a GSM module, using which a signal can be sent to his friends about some information.
- This prototype can be extended to add a GPS module, using which the impaired person can and the routes to some places he wants.

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Thank You