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WAY FINDING AND CURRENCY DETECTION FOR VISUALLY IMPAIRED PERSONS

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***Abstract*— Our project opens up a world of possibilities for solving day to day problems for the visually impaired and sighted alike. The proposed system overcomes four major issues addressed by the prototype for visually impaired persons. Firstly, Identification of colors of the object present around the visually impaired people. Color variability is done through grayscale based vision algorithm that is difficult to work. So, in this paper we propose a color vision algorithm that consists of two methods namely 1.) An artificial color contrast as a pre-filter that aims at highlighting the target while suppressing its surroundings 2.) Statistically based fast bounded box (SFBB), that utilizes the component analysis technique to characterize the target features in color space which is obtained from a set of training data through which the color classification can be performed accurately and efficiently. Secondly, the currency along with the fake note detection is done by a component based recognition system which uses the speed up robust features (SURF) algorithm. The input image is converted to grey scale, the grey image is extracted and compared with an algorithm and then the voice output is produced through the earphone to visually impaired users. Thirdly, the optical character recognition algorithm is used to convert the given text into voice output with the help of the e-speak engine. Finally, the detection of the obstacle in front of visually impaired users is also been achieved by using Ada-Boost model to differentiate between human and vehicles and given as voice output.**

Keywords*— *Statistically based fast bounded box(SFBB), Speed up robust features(SURF), Optical character recognition(OCR).

I. INTRODUCTION

Visually impaired persons find very difficult to identify the color of the object, currency and fake note detection, to read the text in the product labels, new papers, receipts, bank statements and to detect the obstacle in front of them. There are no proper systems to help the visually impaired persons. Some products are available separately in the market but here we introduce a switch based algorithm to implement all these four modules into a single product which is able to switch among these modules.

II. COLOUR DETECTION

Color information is useful in vision-based feature detection, particularly for color detection where color variability often renders grayscale based machine vision algorithms that are difficult or impossible to work with. So in this paper, we propose a color machine vision algorithm that consists of two methods.

1) Firstly, it creates an artificial color contrast as a pre-filter that aims at highlighting the target while suppressing its surroundings.

2) Secondly, referred to here as the statistically based fast bounded box, utilizes the principal method analysis technique to characterize target features in color space from a set of trained data so that the color classification can be performed accurately and efficiently.

3) Flow chart

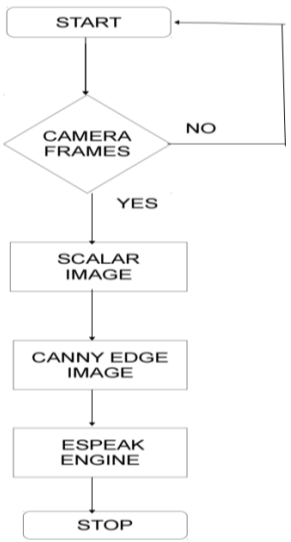


Fig 1: Flowchart for colour of the object detection.

III. CURRENCY AND FAKE NOTE DETECTION

Currency and fake note detection can be done by SURF (speeded up robust features algorithm) which is a robust algorithm used to identify the watermark and pixel intensities of the images. Feature detection is a image processing operation which is performed as the first operation to capture a image and examines every pixel to see if there is a feature present at that pixel. Many computer vision algorithms use feature detection as the initial step. So as a result, a very large number of feature detectors have been developed.

1) Distinguish interest point descriptors:

The currency note is kept in front of the camera and from the captured image SURF (Speeded Up Robust Feature) detector is used to observe the water mark and pixel intensities. Each pixel in a currency note has different color range. These specifications are noted in a circle. The input image is converted into a grey image and then into binary image.

2) Distinguish key points:

Once the specifications are identified, the corresponding key points are gathered. The input currency note specification and key points are gathered and stored separately. Then the predefined currency note specification and key points are gathered from the information set and it is also stored separately. Each key point has a decimal value and those decimal values are summed up and its threshold value is compared with the predefined threshold value. If the value is around 0.5 to 1.0, then the image is matched with corresponding object or else not. Optical character recognition which can handle images with complex background converts the image into text and gives the output to the e-speak engine. The audio output is produced and given out via the earphone.

3) Block diagram:

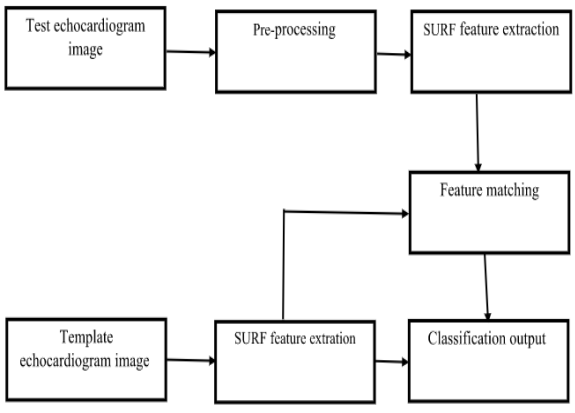


Fig 2: Block diagram for currency and fake note detection.

4) Flow chart

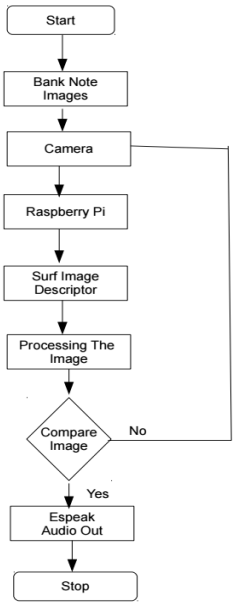


Fig 3: Flow chart for currency and fake note detection.

IV. TEXT READING

The live video is captured by using web camera and it can be done using OPENCV libraries. The image format from the web camera is in RGB24 format. The captured videos are projected in a window with a size of 320x240. Totally ten frames per second can be captured by using the web camera. To identify the text from the input image, first the video captured is converted into frames and then each frame is converted into gray image and finally into a binary one. Then the text localization is applied on the binary image to localize the text from the background. The output is given to the optical character recognition for the text recognition and the audio output is obtained.

1) Text localization algorithm:

Text localization algorithm takes the frames which are segregated from the video as the input and the Region of Interest (ROI) is found by taking only the required text area from the image. The ROI region is confined within the rectangular area contain the text which is to be get detected, and that text which is inside the ROI is first converted to the grey image and then to the binary image. The Region of Interest is specified and the localized text gets compared with the predefined text in the training set by the Ada-boost Model. Ada-boost Model is in charge for identifying which alphabet is exactly located on the identified region.

2) Haar Cascade-Ada-boost Model:

Ada-boost Model is the effective machine learning training set for text detection. The training set consists of positive and

negative samples where the positive samples comprise of the text images and the negative samples comprise of the images other than the text present in the input image. The input image is given to Haar Cascade to analyze the text which is inside the ROI and match the input text with the predefined text in the training text. Both the existing training set and the given input image are compared to identify variations. The one to which the range of similarity is high, is then confirmed to be the character and the corresponding audio is produced.

3) Audio Output Using E-Speak Engine:

Optical Character Recognition (OCR) is the mechanical or electronic conversion of images of typewritten or printed text into machine-encoded or computer-readable text. The output of the haar-cascade is stored in out.png file which dynamically overwrites the text with every frame. The processed output is sent to the e-speak engine which is based on Microsoft Speech Synthesizer Development kit and the audio output is generated and given out via the ear phone.

4) Flow chart

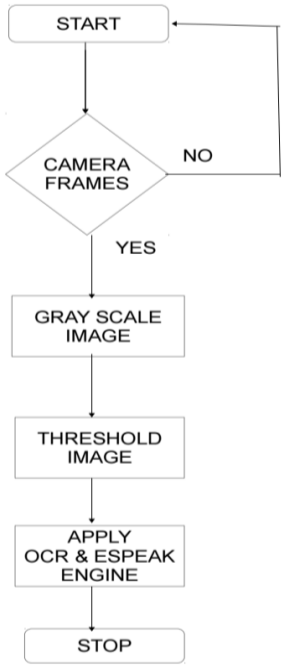


Fig 4: Flow chart for text reading.

V. BLOCK DAIGRAM

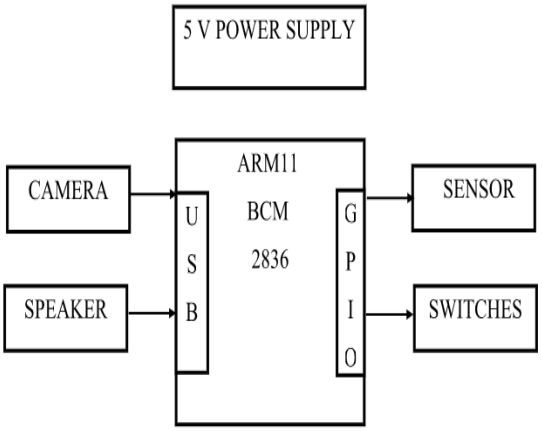


Fig 5: Block diagram for full prototype.

ARM11 processor is the interface to the camera and ultrasonic sensor. It captures the image and converts it to a text file using OCR engine. It differentiates the various currency notes while making payments. Ultrasonic sensor is used to navigate in indoor, because of the various obstacle detected in indoor.

VI. CIRCUIT DAIGRAM

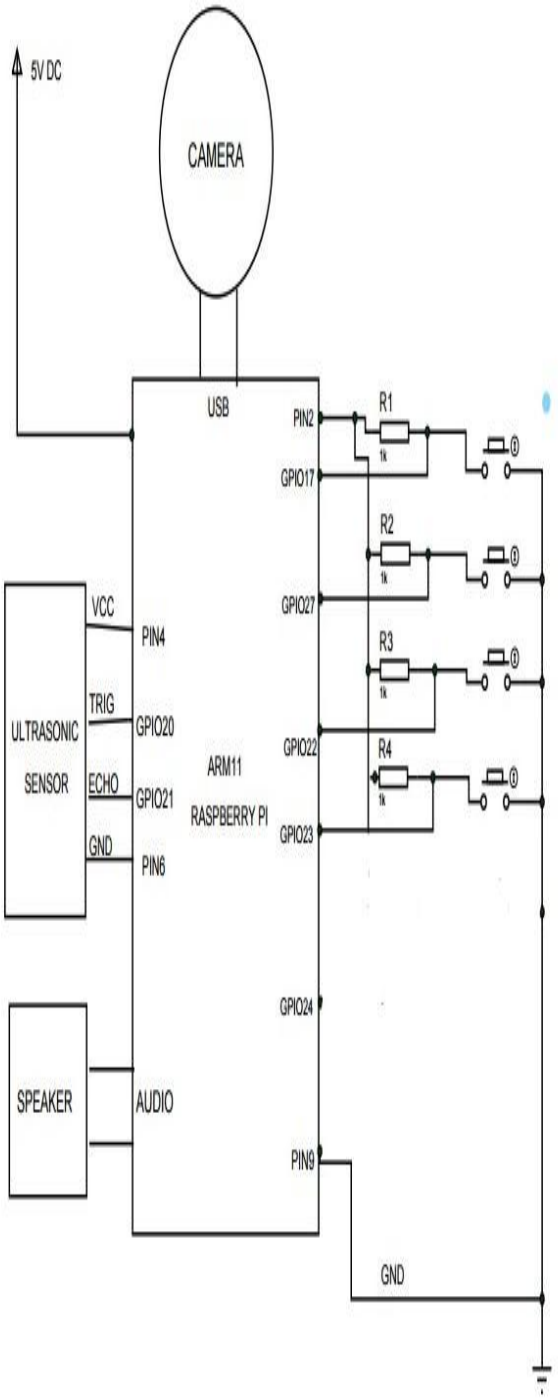


Fig 6: Circuit diagram for full prototype module.

VII. RASPERRY PI

Here we have used raspberry pi 2 for our proposed system and the particular specification is RASPBERRYPI-MODB-1GB and RPI-MODB-16GB-NOOBS.

1) RASPBERRYPI-MODB-1GB

The Raspberry Pi 2 delivers 6 times the processing capacity of previous models. This second generation Raspberry Pi has an upgraded Broadcom BCM2836 processor, which is a powerful ARM cortex-A7 based quad-core processor that runs at 900MHz. the board also features an increase in memory capacity to 1Gbyte.

2) SPECIFICATIONS

- Chip — Broadcom BCM2836 SoC
- Core architecture — Quad-core ARM Cortex-A7
- CPU — 900 MHz
- GPU — Dual core (Video Core IV)
- Memory — 1GB LPDDR2
- Operating system — Linux
- Dimensions — 85*56*17mm
- Power — Micro USB socket 5v. 2a

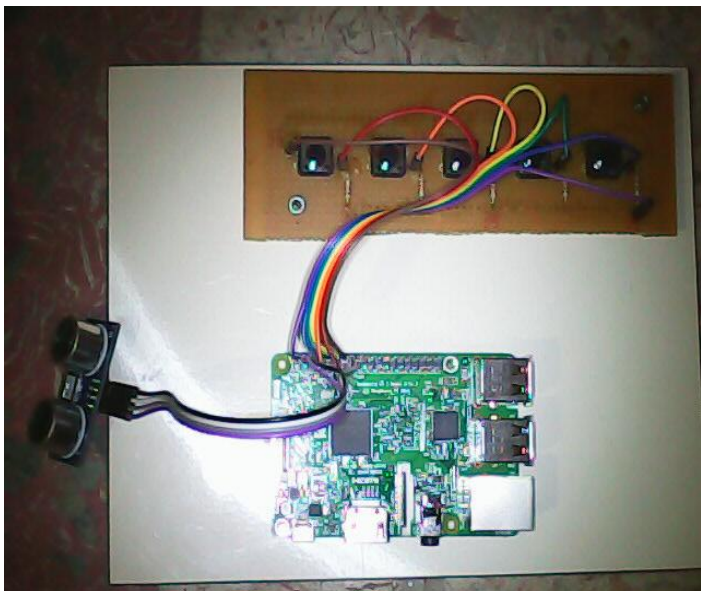
3) RPI-MOB-16GB-NOOBS

4) CONNECTORS

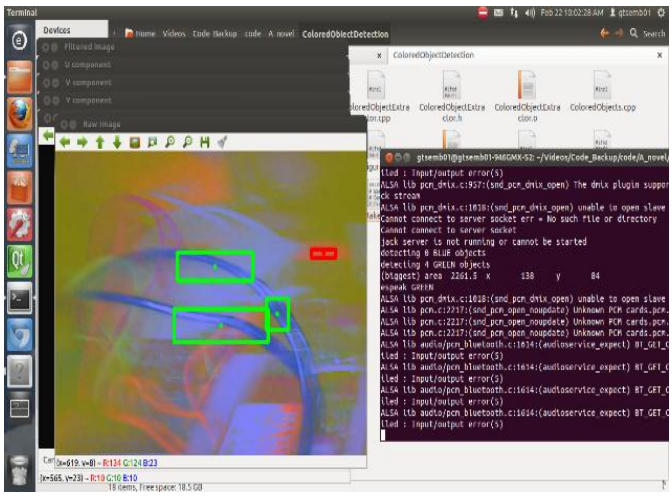
- Video output HDMI (rev 1.3 & 1.4)
- Audio output 3.5mm jack, HDMI
- USB 4 * USB 2.0 connector
- Memory card slot micro SDIO

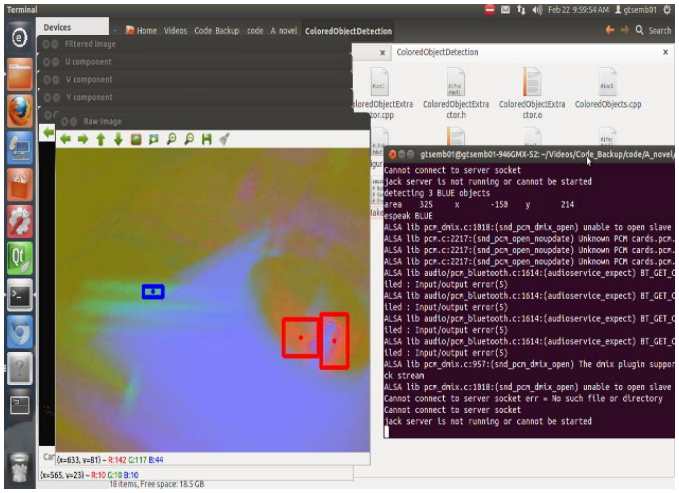
VIII. PROJECT RESULTS

1) Final kit setup

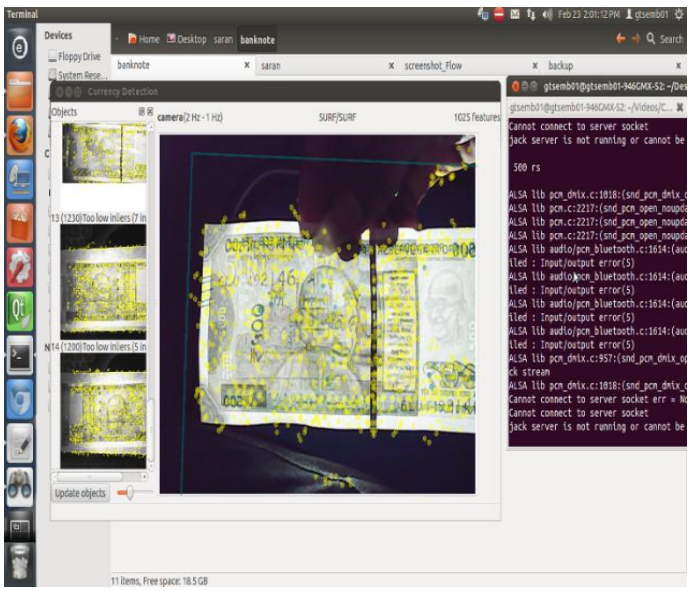


2) Colour of the object detection module





3) Currency and fake note detection module



IX. CONCLUSION

Thus, there are many problems faced by the visually impaired persons in our society. They faces many type of hurdles in performing every day routine works. So, our proposed system overcomes four major issues faced by visually impaired persons like fake note detection, color detection, obstacle detection and finally text detection. So, here we conclude that it will surely help the visually impaired persons in a trouble-free manner.

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