INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X
Impact factor: 4.295
(Volume 4, Issue 5)
Available online at: www.ijariit.com

Assistive aid development for blind people using Internet of Things (IoT)

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ABSTRACT

This paper is focused to build up a Raspberry Pi based supportive guide for outwardly hindered clients utilizing haar-course and LBP calculation. Individuals who are outwardly hindered battle every day in acting activities that might be as clear as moving from one reason to an alternate while not tumbling down or sound against obstructions. An Electronic Travel Aid (ETA) could be a kind of accommodating innovation having the point of face recognizable proof, MRP discovery, control electrical apparatuses, area ID further as perusing daily papers and books. The most preferred standpoint of utilizing haar-course strategy is it's to a great degree location precision and furthermore used to identify the substance of the individual. The upside of utilizing the LBP system is its shorter preparing time and is utilized to break down the face. A model at the minimal effort is produced to the issues being for some time looked by the outwardly weakened while communicating with their condition.

Keywords— *Raspberry Pi, Local binary pattern algorithm (LBP), Haar-cascade, Electronic travel aid*

1.INTRODUCTION

As indicated by the World Health Organization (WHO), there square measure 285 million outwardly debilitated people inside the world, thirty-nine million of that square measure visually impaired and 246 million have an intermittent vision. These days, advances rule and construct individuals' assignments direct in a few areas. With 7.8 million visually impaired people in an Asian country, the nation represents twenty endeavors the thirty-nine million visually impaired populace over the world, of that sixty-two you're by virtue of waterfall, almost twenty you'll require refractive blunder, 5.8 % malady, and standard division film disablement. On the contrary, hand, once the Asian country needs twenty-five thousand allowed eyes every year, the nation's 109 eye banks (five in Delhi) figure out how to assemble at the majority of essentially twenty-five thousand eyes, of that half-hour can't be utilized. Maturing populaces and way of life changes result in incessant glaring conditions like diabetic retinopathy those ascents exponentially. While not successful significant mediation, the measure of visually impaired people worldwide has been anticipated to increment to seventy-six million by 2020 if this pattern proceeds. Individuals who are outwardly debilitated still battle multi-day in performing expressions activities which will be as simple as moving from one reason to an alternate while not tumbling down, or thump against hindrances. Guide pooches are horribly proficient aides for the visually impaired, anyway, they require the top to bottom instructing, and that they square measure exclusively accommodating for concerning 5 years. Likewise, a few visually impaired and outwardly impeded people square measure matured and see it intense to stress befittingly for one all the more living being. An assortment of misperceptions with respect to qualification criteria rose up out of the study, exceptionally the possibility that you basically must be constrained to be entirely ignorant concerning fit the bill for a seeing-eye canine. This conviction was the premier regular purpose behind non-proprietors not holding a candle to the current situation for a guide puppy (40%, ascending to 44% of men and those of working age), and the motivation behind why the most elevated extent (17%) of current proprietors had at first been put off applying. Different misperceptions about qualification included age limits (7% of non-proprietors, 2% of those present proprietors), non-qualification of those with numerous inabilities (6% of non-proprietors, 1% of current proprietors) and cost of possession, including purchasing the canine and on-going veterinary bills.

The movement of a visually impaired individual in obscure surroundings is to some degree simply like that of a portable instrument. Both have the physical capacity to play out the movement, however, they rely upon a tangible framework to distinguish obstructions in the environment, and hand-off the data to the control framework (human mind or movement control PC). The objective of the leads spoke to in this paper is to limit content like picture locales and pre-process those in a way that will influence OCR to work all the more dependable. The approach portrayed in the paper offers attractive recognition rate and we propose a camera based assistive content perusing to help a visually impaired individual in perusing the content present on the caught picture. This paper is a push to limit the reliance of the client on the general population around him while doing tasks regularly. The idea of a wearable gadget, which underpins the general human inclination of indicating at objects communicate with the earth.

2. PREVIOUS WORK

An Enhanced Obstacle Avoidance Method for the Visually Impaired utilizing Deformable Grid is proposed by Mun-Cheon Kang, Sung-Ho Chae, Jee-Young Sun, Sung-Ho Lee, and Sung-Jea Ko. The idea of a wearable gadget, which underpins the general human propensity of indicating at objects communicate with the earth. A model to a minimal effort answer for the issues looked by the outwardly disabled while connecting with their condition A Wearable Ultrasonic Obstacle Sensor for Aiding Visually Impaired and Blind Individuals is proposed by V.DianaEarshia, S.M.Kalaivanan, K.BalaSubramanian.The point of this paper is to give a deterrent identifier to dazzle people, so they can ready to cross through the obstructions effectively without their strolling stick. They are given exhibitions to wear on, which are inserted with ultrasonic separation estimation scale hardware and a camera with an earphone. Keen Guiding Glasses for Visually Impaired People in Indoor Environment is proposed by Jinqiang Bai, Shiguo Lian, Zhaoxiang Liu, Kai Wang, Dijun Liu. This paper shows a novel ETA (Electronic Travel Aids)- savvy controlling gadget in the state of a consolidate of eyeglasses for giving these people steerage with effectiveness and safety. It is a customer gadget for serving to the outwardly disabled people to movement securely.

3. PROPOSED WORK

For people that lost the optical capacity to translate their environment, way-finding that needs the individual to explore indoor or out of ways to the goal is usually an unnerving assignment. Late advances in close to home cell phones equipped for finger peruser zone unit utilized for perusing daily paper. Switches zone unit acclimated administration the gadgets. Exclusively snag discovery is authorized and conjointly confront ID and site identification modules territory unit independently realistic in advertise. It's troublesome for them to hold very surprising modules with them. In this venture confront recognizable proof, area recognition, daily paper peruser, and rate identification module are incorporated in an exceptionally single wearable gadget. Utilization of finger for perusing the content is defeated by the camera module.

3.1 Identification of face

In this day and age, confront acknowledgment is an urgent half for the point of security and police work. In this way, there's a longing to relate conservative and esteem powerful framework. We will likely investigate the plausibility of executing Raspberry Pi principally based face acknowledgment framework abuse standard face identification and acknowledgment systems like Haar discovery and LBP The countenances can be recognized when a man goes into the casing utilizing haar course calculation. Recognized countenances are distinguished utilizing LBP calculation. The live stream is contrasted and already put away picture. In the event that the outcome is coordinated, at that point, it will illuminate to the client through the speaker.

3.2 Haar cascade for face detection

HAAR feature

It is a machine learning based approach where a cascade operates is trained from heaps of positive and negative pictures. it is then want to discover objects in different pictures. here we'll work with face detection OpenCV's algorithm is currently using the following Haar-like features which are the input to the basic classifiers [6].

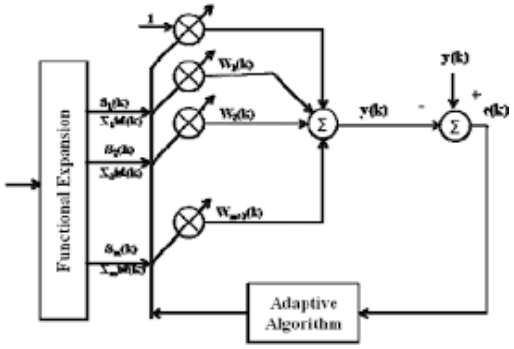


Fig. 1: Basic classifier

3.3 Classifiers of cascade

Instead of applying all the 6000 options on a window, cluster the options into totally different stages of classifiers and apply one after another. (Normally 1st few stages can contain terribly less range of features). If a window fails the primary stage, discard it. We do not take into account remaining options on that. If it passes, apply the second stage of options and continue the method. The window that passes all stages may be a face region. LOCAL BINARY PATTERN (LBP) There exist many strategies for extracting the foremost helpful options from (preprocessed) face pictures to perform face recognition.one among these feature extraction strategies is that the Local Binary Pattern (LBP) methodology. Ojala et al introduce this approach in 1996 [6]. With LBP it's potential to explain the texture and form of a digital image. This can be done by dividing a picture into many tiny regions from that the options are extracted. Figure 2

Fig. 2: A pre-processed image

A pre-processed image divided into 64 Regions The LBP feature vector, in its simplest kind, is made during this manner: Divide the examined window to cells (e.g. 16x16 pixels) for each single part at intervals the cell, compare the part to each of the eight neighbors (on its left high, left middle, left bottom, right top, etc.). Follow the Page 57 pixels on the circle, i.e. clockwise or opposite clockwise direction. where the center pixel's worth is larger compared to a neighbor, write "1 " else write "0 ".This gives academic degree 8-digit binary vary (which is typically reworked into decimal for convenience) cipher the chart, on the cell, of the frequency of each "number" occurring (i.e., each combination of that pixels area unit smaller which area unit larger compared to center). Optionally normalize the chart. Concatenate normalized histograms of major cells. This is supply to all cell. The characteristic vector of the window. The local binary pattern (LBP) was originally designed for texture description.

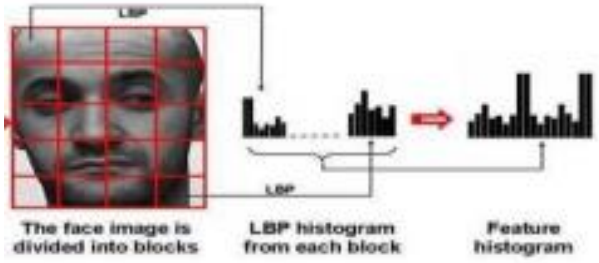


Fig. 3: Identification of face

3.4 Text recognition

This model has been built around the raspberry pi processor board. It's dominant the peripherals like Camera, speaker associate degree alphanumeric display that acts as an interface between the system and therefore the user. Optical Character Recognition or OCR is enforced during this project to acknowledge characters that area unit then scan out by the system through a speaker. As shown within the project setup, the camera is mounted on a fill-in such an edge that if a paper is placed in between the world marked by angular braces, it captures a full read of the paper into the system. Also, once the camera takes the photo of the paper, it's ensured that there are smart lighting conditions. The content on the paper ought to be written in English (preferably Times New Roman) and be of fine font size (preferably twenty-four or additional as per MS Word). One of these conditions area units met the system takes the picture, processes it and if it acknowledges the content written on the paper it'll announce on the speaker that the content on the paper has been with success processed. Once this it speaks out the content that was regenerate into text format within the system from the process the image of the paper. during this method Raspberry Pi primarily based Reader for Blind helps a visually handicapped person to scan a paper while not the assistance of any human reader or while not the assistance of tactile writing. The OCR suggests that Optical Character Recognition. This algorithm is used for converting the captured image into readable codes.

3.5 MRP Detection

The MRP detection system undergoes the following process, 1. Capture the image. 2. Localize the text region. 3. The text is cropped from the image. 4. Recognize the price. 5. Converting the text to speech by the e-Speak tool.

3.6 Location identification module

The location is identified using the GPS module. The location details are known to the user using the speaker. The visually impaired person issues the command and receives the direction response using audio signals. The latitude and longitude values are received continuously from the GPS receiver. The locations are given to the user with the help of audio signals.

3.7 Electrical appliance control

Using voice commands the user can able control the electrical appliance like a fan, lamp etc. This module converting the voice signal into binary code. This generated binary code is given to the microcontroller as input. The microcontroller generates the output according to the voice input. Thus using this module we will control switch relay corresponding to the voice command.

4. ARCHITECTURE DIAGRAM

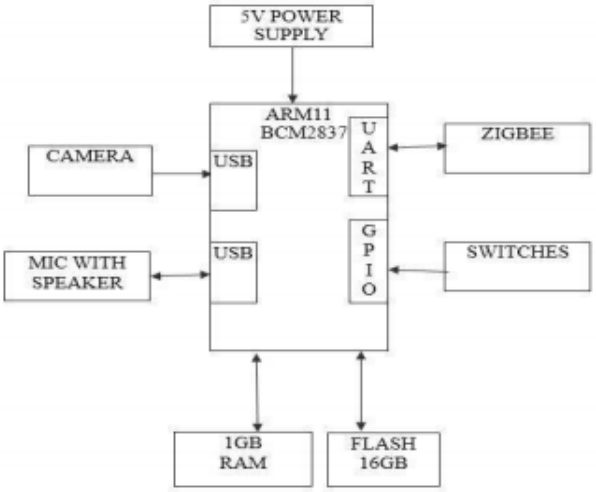


Fig. 4: Wearable kit block diagram

4.1 Block diagram description

In this paper, the ARM11 processor is interfaced to the camera, microphone, and speaker. The camera is mainly used for five purposes. First, detect the MRP rate, and second, detect the GPS location. Third, Face recognition. The fourth one is road sign recognition and reading a newspaper. The microphone is used to control the 230V devices using voice commands. When a voice command is matched that time control signal send to the Pic16f877a microcontroller through ZigBee, so 230V device is activated through the relay. Speaker is used to telling the MRP rate, Road signs information, news present in paper and GPS location and the known person or not. Switches are used to changing the mode of operation in this device. Relay act as a switch when voice commands are matched by switching the 230V supply into Lamp.

5. COMPONENTS USED

5.1 BCM 2837

This is the Broadcom chip used in the Raspberry Pi 3, and in later models of the Raspberry Pi 2. The underlying architecture of the BCM2837 is identical to the BCM2836. The only significant difference is the replacement of the ARMv7 quad-core cluster with a quad-core ARM Cortex A53 (ARMv8) cluster. The ARM cores run at 1.2GHz, making the device about 50% faster than the Raspberry Pi 2. The Video Core IV runs at 400MHz.

Fig. 5: Raspberry Pi processor

5.2 Microcontroller

The PIC microcontroller PIC16f877a is one in all the foremost known microcontrollers within the business. This controller is extremely convenient to use, the committal to writing or programming of this controller is additionally easier. One in all the most benefits is that it will be write-erase as repeatedly as potential as a result of it use non-volatile storage technology. It's a complete range of forty pins and their square measure thirty-three pins for input and output. PIC16F877A issued in several pic microcontrollers comes. PIC16F877A additionally have several applications in digital electronics circuits.

5.3 Zig-Bee

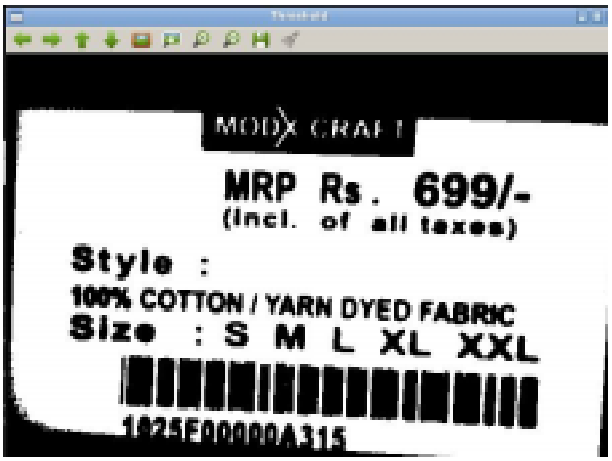
The distances which will be achieved transmission from one station to subsequent extend up to concerning seventy meters, though considerably larger distances are also reached by relaying information from one node to subsequent in a very network. Vol.2 - No.1 March 2018 ISSN: 2456

6. EXPERIMENTAL RESULTS

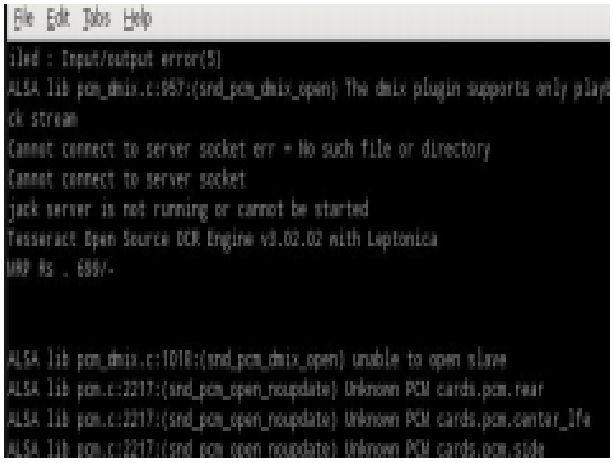
6.1 MRP Detection

Figure 6 shows the MRP detection in this investigation. Figure 6 (a) shows the Original image. Figure 6 (b) shows the threshold image and figure 6 (c) pointed out the output image for MRP detection.

(a) Original image



(b) Threshold image



(c) Output image
Fig. 6: MRP Detection results

6.2 Face identification

Figure 7 indicated the face detection using HAAR cascade a d LBP algorithm. Figure 7(a) shows the face detection using haar cascade and figure 7(b) mentioned the face identification using LBP algorithm.

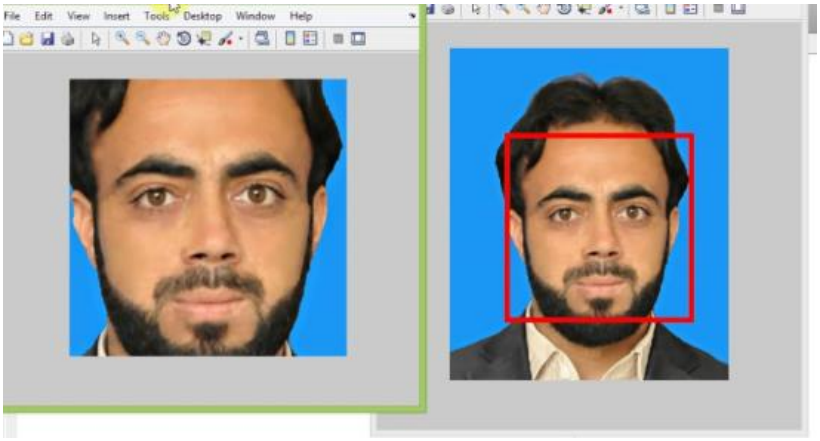


Fig. 7: Face detection (a) Face detection using HAAR cascade (b) Face detection using LBP algorithm

7. CONCLUSION

The main challenge of the proposed work is an effort to minimize the dependence of the user on the people around him while carrying out chores on a daily basis. The concept of a wearable device, which supports the general human tendency of pointing at objects to interact with the environment. A prototype to a low-cost solution to the problem faced by the visually impaired while interacting with their environment. This device will help the blind people to do their work independently. Reduce manual work and it is more efficient and reliable Page

8. REFERENCES

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