Assistance for Blind People

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Abstract— Visually challenged humans need help to navigate through the contemporary dynamic international and continuously face many obstacles inside the process. With an intention to not to let physical challenges avoid their boom and render them independence, to an extent, this paper proposes a simple and economical device for the visually challenged. This device is composed of a hat (with a digital camera attached) and headphones. The device warns the wearer if there is any person is approaching, via a voice message, and publicizes if the said individual is familiar (with name) or unknown. This enables the wearer investigate his/her surroundings. The hat is convenient to apply without any complications and is affordable, which can be used by humans with partial vision as well.

Keywords: Raspberry Pi, Haar Cascade Classifiers, Histogram, LBP Algorithm

I. INTRODUCTION

Vision impairment is a diminishing in sight which results in partial or complete blindness. Blindness is defined because the failure of a person to rely on fingers from 6 meters (Technical definition) and imaginative and prescient 6/60 or less [1]. People who are visually impaired by these requirements face many barriers and dangers in everyday life. Even the revolutionized technology has no longer been able to render them absolute independence. There are numerous mental and social implications of blindness [2]. The proposed device aids visually impaired in social conditions via helping them recognize people. A Raspberry Pi, that's a low cost, credit-card sized personal computer that plugs into a personal computer reveal or Television, and makes use of general keyboard and mouse, is used to acquire the purpose [3]. Raspberry Pi is often used for real time human and machine interplay applications [4]. A webcam captures the images which are the result of the frame by body collection from the video that the webcam captures and the video can be streamed on the display screen when related to a monitor [5]. OpenCV has several constructed in libraries which may be utilized in many real time technologies and solving several problems [6]. Haar Cascade classifiers are educated to detect gadgets in any type of lights [7]. Haarcascade_frontalface_default.Xml record is loaded into this system and maintains a track of each individual [8].

Numerous algorithms are gift for face recognition, some of them include Local Binary Pattern and Fisher Linear Discriminant Algorithm [9]. Here, LBP set of rules is used to acquire face recognition [10]. LBP replicates details of texture, therefore giving specific results [11]. It makes use of histograms, which might be numerical description of intensity distribution in photo and are prominently used in maximum of the photo processing techniques [12]. In LBP 3x3 matrix is determined, concerning the intensities of input photograph [13]. Input picture and stored photo are said to be same if those 3x3 matrix for both photos suit, for this reason attaining face recognition.

The webcam inside the tool captures the photograph of an approaching character and takes it as input. Haar cascade classifier this is used to detect any face in the taken input. LBP set of rules tries to in shape this input records with the statistics that was previously saved. If matched, it is announced, via the headphones linked in audio jack that the individual (who was previously stored), is approaching. If unmatched it's far introduced that an unknown character is approaching.

II. LITERATURE REVIEW

The proposed tool consists of a hat outfitted with a webcam and a raspberry pi. Raspberry Pi is linked with OpenCV, an open source C++ library of programming functions that is utilized in image processing. The predefined classifiers in OpenCV are utilized in face detection. The webcam captures snap shots of the approaching person. Then the raspberry pi detects the face and compares it with the formerly saved data in archives. If the records is matching, it is warned that (name if the character) is near, if not it's miles warned that an unknown character is approaching.Fig.1 represents the block diagram of complete device, The webcam captures the video of scene and extracts a single body continuously.

It detects faces and saves the information for future use. Later when input is given it compares the input to previously saved records and identifies the face if the input is matching with the saved statistics. And output is located from microphone. For the process of face recognition, LBP technique is implemented. Depending at the output, the Pi plays formerly recorded voice messages to the wearer which can be heard on the headphones.

Hardware installation and block diagram of the proposed machine is shown within the following Fig.2 and Fig.3 respectively. The hardware setup of the tool includes, raspberry pi, webcam and head phones are used. Raspberry Pi has an ARM microprocessor at its core. It can be used to explore computing and build smart devices. Raspberry Pi is low powered and is composed of a fixed GPIO (general purpose input output) pins that lets in control of electronic components, to user, for bodily computing and discover the (IoT).

The block diagram in fig.3 represents the setup. It consists of a raspberry pi that is linked to a power supply. The scene is captured with the use of webcam. It takes a video of the scene and each body is then processed as an image. The output is located by using headphones that are connected to the audio jack of raspberry pi. The following are the prerequisites.

In order to proceed, an archive is required to save files that are critical for face recognition. The following files want to be saved within the archive:

− Face_detection.Py

– Haarcascade_frontalface_default.Xml (haar cascade training data)
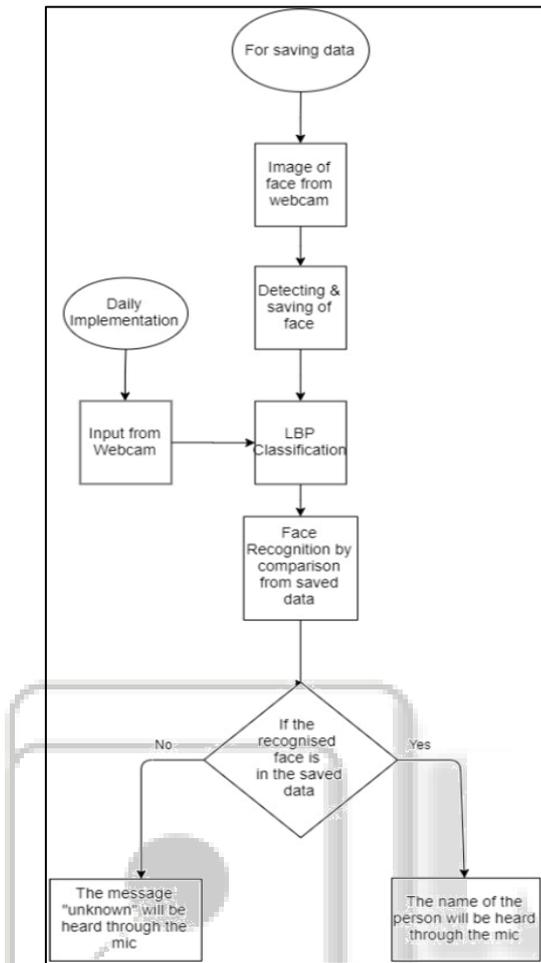– Photos

Fig. 1: Block Diagram of Complete Device

Fig. 2: Hardware Setup

Fig. 3: Block Diagram of Hardware Installation

III. PROPOSED SYSTEM

OpenCV consists of a trainer in addition to a detector, by way of default. Any form of classifier can be created to locate cars, planes and numerous objects. In the proposed system, face detection and popularity are dealt with OpenCV consists of many predefined classifiers for face, mouth, eyes etc. These XML files are cached in OpenCV data Haar Cascades folder. Haar Cascade is a classifier that is used to diagnose an entity for which it has been tutored to fro the source. This classifier is trained by way of layering the fantastical photograph over fixed negative pictures. The tutoring is commonly finished on a server and on various stages. Finer results can be obtained with the aid of using excessive grade pix and growing the range of tutoring phases for classifier. XML classifiers which are required in detecting a face is loaded, after which input image is loaded, in gray scale mode.

The input picture is paralleled with the classifier inside the archive. Once detected, the faces are highlighted with boxes round them and are snipped and stored to precise paths. The explained matters are represented as a go with the flow chart as proven in Fig.4. Face recognition isn't always simple, due to the fact that the photograph with unidentified face in extraction segment is generally special from the image with cached face in classification section. Despite nearby binary capabilities get extricated from the input for face recognition, the input picture has to be in comparison with several photographs were formerly cached in the database. Lighting and environmental conditions play a critical role.

Fig 4: Block Diagram of Face Detection and Saving
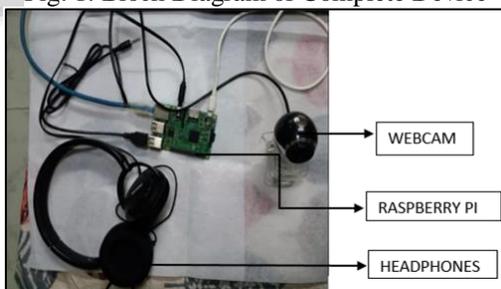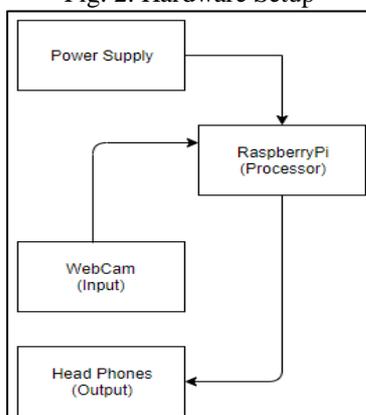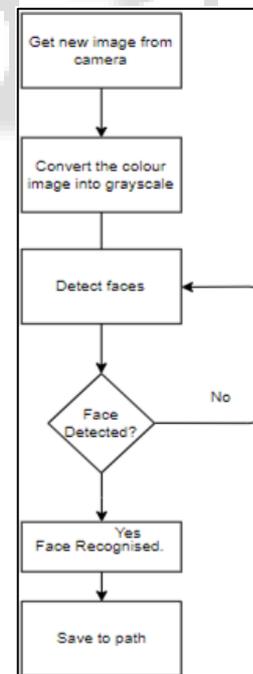
Additionally, the face photo changes with expression. Local Binary Patterns (LBP) technique is applied for face recognition. This approach works on local capabilities that make use of LBP operator, which recapitulates the nearby special shape of a face picture. LBP may be described as an order set of binary evaluating of

pixel intensities between the centre pixels and all of its surrounding pixels in 3x3 matrix.

Local Binary Pattern does this contrast through applying the subsequent method:

$$LBP(x_C, y_C) = \sum_{n=0}^{7} S(i_n - i_c)(2^n) \qquad (1.1)$$

$$S(i_n - i_c) = \begin{cases} 0, & (i_n - i_c) > 0 \\ 1, & (i_n - i_r) \leq 0 \end{cases} \qquad (1.2)$$

$S(i_n - i_c)$ is the system that is used to find out the threshold cost of the neighbouring pixels to the middle threshold pixel of the 3x3 matrix. All the threshold neighbouring pixels are organized in a selected order (clockwise or anti-clockwise) starting from LSB to MSB forms the LBP pattern. LBP (x_c, y_c) is the components to calculate the unique LBP code by using multiplying the threshold values with their respective weights. Where 'i_c' corresponds to the gray fee of the centre pixel inside the received 3x3 matrix multiplied by the price of eight surrounding pixel values in the identical matrix. 'n' corresponds to neighbourhood wide variety and 'i_n' is the gray fee of the same.

The entire picture is parted into several blocks. Each block consists of a 3x3 matrix with values corresponding to intensities of the photo. The 3x3 matrix formed from the unmatched block of the entire photograph is compared with the similar block of the saved photo of face. If the acquired 3X3 matrix becomes the centre pixel of the following 3x3 matrix. This technique of comparison happens till the location of the face is completely covered.

If most of the 3x3 matrices match, the system arrives at a conclusion that the saved image and the input photograph are identical. This 3x3 matrix is also known as Histogram. The output is displayed on the display as nicely as it is converted within the code and the speech is received on a microphone. Fig.6. represents the flowchart of face recognition using LBP algorithm.

The aim of this paper is to design an aid for the visually impaired to recognize people.

Algorithms used to be able to reap that are:
1) Local Binary Patterns Histogram Algorithm: for recognition of faces
2) Haar Cascade Classifier Algorithm: for detection of faces

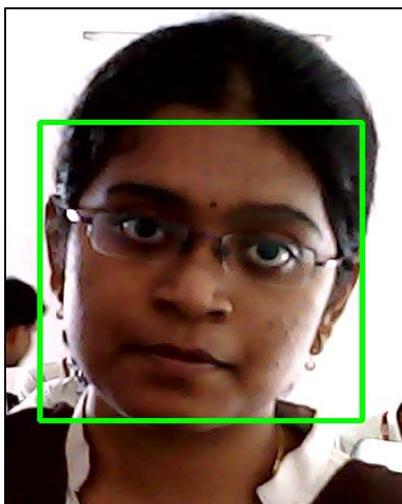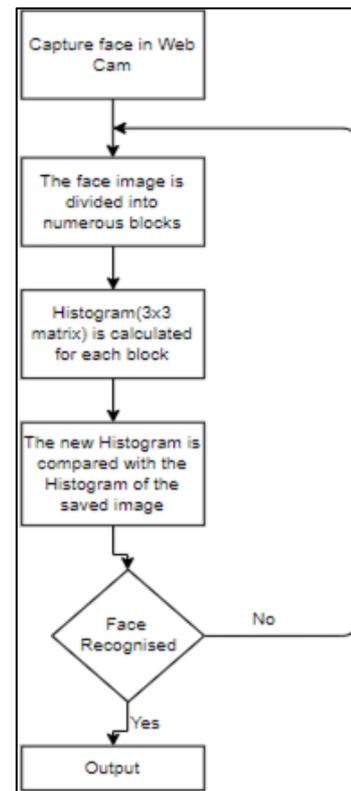Fig. 5: Face Detected from Web Camera

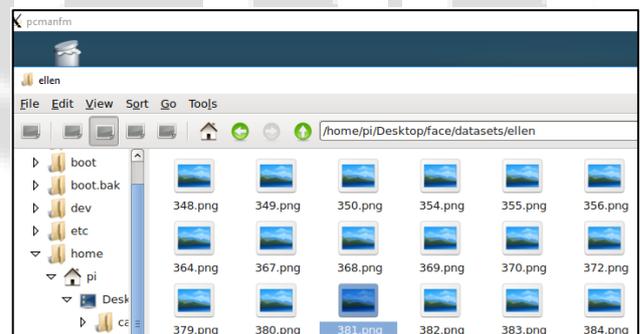Fig. 6: Block Diagram of face Recognition from Datasets

IV. CONCLUSIONS

Fig. 7: Saved Datasets

First half of the proposed system makes use of haar cascade classifier set of rules to hit upon faces and saves the consequent frames consistent with the route it has been coded. Fig.6. shows the facial photograph being detected. Whenever there is a face detected, the raspberry pi is coded such that it saves the statistics in a specific course. Also it checks for the given direction and if any course of given particularities isn't always observed, it creates a new course.

We can confine the number of frames to be taken into consideration inside the search of human face in the body which is converted into gray scale and to shop the snipped face underneath his/her call if determined a face using haar cascade classifier algorithm. As it may be visible from the figure 6 that the statistics is stored in a selected folder underneath the call of the known individual and has been labelled with the frame wide variety of that is retrieved from live video of the webcam. Second ½ of the proposed system uses both the algorithms returns the call of the

character if the face is known, else returns unknown if the person is unknown.

An example of the returned information is shown in the Fig.8. In this case, the faces ought to be resized to identical as that of one carried out to the earlier information at the stage of making database. The set of rules after being educated with all the statistics to be had will then be equipped first of all recognising faces. The set of rules after being educated with all the statistics to be had will then be equipped first of all recognising faces. The algorithm after evaluation returns an array comprising of self-assurance level at its first index and the report call (body number) at its zeroth index. Confidence stage is the contrast thing between two images, it's far inversely proportional to similarity among the respective images.

The name of the known individual in front of the user may be derived as the call of the subdirectory underneath which the unique recognised picture is present. Name "Ellen" in Fig.8. Shows that or tool has identified the man or woman Ellen, who is near the wearer. An accurate system may be executed by way of saving facts in any respect illumination degrees and additionally by way of saving all feasible facial expressions which are expressed via that particular individual and also accuracy can be improved by way of decreasing the confidence degree of the conditional statement throughout comparing among frames(faces) from stay video of the webcam connected to the hat worn through the user and the faces which might be saved prior, as way to apprehend known human beings which is finished at face detection of the proposed gadget.

The implemented machine detects drawing near faces, through using a trained Haar Cascade classifier. Haar Cascade is a classifier that is educated for the detection of objects. Here on this paper Haar cascade has been used to come across faces.

This classifier is taught via learning from some of positive photos i.e., faces of humans and a number of non-positive photographs i.e., photos that are not faces from which the capabilities are extracted. LBP algorithm is utilized for matching this data (detected faces) with previously saved data, for the purpose of reputation. The set of rules makes use of pixel matrices (i.e, histograms) of gray scale pictures with their brightness tiers as elements of the matrix and therefore compares the histograms of two pictures, if self-belief level is much less than threshold the photos found to be matching and then the tool declares the name of the person.

If the snap shots don't match, its miles announced that the individual is unknown. This is achieved with the use of text to speech conversation and the output voice message is heard through the headphones plugged in to the audio jack of raspberry pi. This salient feature enables the wearer to navigate inside the midst of human beings, with ease. This portable device stands particular as it's far the integration of face detection, face recognition with textual content to speech conversion which enables the visually impaired navigate through human beings via detecting and recognising faces. The scope can be in addition multiplied which includes detecting various items in the input image. This extension can aid the person in each factor of life.

Fig. 8: Output of the Device

REFERENCES

[1] https://www.nhp.gov.in/disease/eye-ear/blindness
[2] https://journals.sagepub.com/doi/pdf/10.1177/070674377602100512
[3] Raspberrypi- www.raspberrypi.org
[4] Suchitra, Suja P. and S. Tripathi, "Real-time emotion recognition from facial images using Raspberry Pi II," 2016 3rd International Conference on Signal Processing and Integrated Networks (SPIN), Noida, 2016, pp. 666-670.
[5] R. Ikhankar, V. Kuthe, S. Ulabhaje, S. Balpande and M. Dhadwe, "Pibot: The raspberry pi controlled multi-environment robot for surveillance & live streaming," 2015 International Conference on Industrial Instrumentation and Control (ICIC), Pune, 2015, pp. 1402-1405.
[6] Pandian, Durai, Xavier Fernando, Zubair Baig, and Fuqian Shi, eds. Proceedings of the International Conference on ISMAC in Computational Vision and Bio-Engineering 2018 (ISMAC- CVB). Vol. 30. Springer, 2019.
[7] D. Tyas Purwa Hapsari, C. Gusti Berliana, P. Winda and M. Arief Soeleman, "Face Detection Using Haar Cascade in Difference Illumination," 2018 International Seminar on Application for Technology of Information and Communication, Semarang, 2018, pp. 555-559.
[8] K. Visakha and S. S. Prakash, "Detection and Tracking of Human Beings in a Video Using Haar Classifier," 2018 International Conference on Inventive Research in Computing Applications (ICIRCA), Coimbatore, 2018, pp. 1-4.
[9] Malathi P., D. Bharathi, and Vinodhini, R. E., "Illumination Invariant Face Recognition using Fisher Linear Discriminant Algorithm (FLDA)", International Journal of Control Theory and Applications, vol. 9, no. 10, pp. 4201-4210, 2016.
[10] J. O'Toole, Yi Cheng, P. J. Phillips, B. Ross and H. A. Wild, "Face recognition algorithms as models of human face processing," Proceedings Fourth IEEE International Conference on Automatic Face and

Gesture Recognition (Cat. No. PR00580), Grenoble, France, 2000, pp. 552-557.

[11] S. A. A. M. Faudzi and N. Yahya, "Evaluation of LBP-based face recognition techniques," 2014 5th International Conference on Intelligent and Advanced Systems , Kuala Lumpur, 2014, pp. 1-6.

[12] M. J. Asharudeen and Menon, H. P., "Edge detection using histogram localization", Indonesian Journal of Electrical Engineering and Computer Science, vol. 11, pp. 341-355, 2018.

[13] Ravi Kumar Y B and C. N. Ravi Kumar, "Local binary pattern: An improved LBP to extract non uniform LBP patterns with Gabor filter to increase the rate of face similarity," 2016 Second International Conference on Cognitive Computing and Information Processing (CCIP), Mysore.