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Research Paper

FACE DETECTION AND RECOGNITION USING LBPH

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Now a days the problem which leads to low performance face recognition in law enforcement, security system access, authentication of banking is high false positive face detection. To reduce the false-positives drastically and increase the efficiency in this research, we are using haar like features and for recognition of face we are using Local Binary Pattern Histogram (LBPH). A cascade classifier is used in face detection and face recognition is carried out in three stages feature extraction, matching and classification. The unique and at most useful features are extracted and face image is compared with images in database during last stage (classification). In this local binary pattern for person's face recognition consider both shape and texture information for evaluation. The image that is given is segregate into small parts from which Local Binary Pattern are taken and clubbed into a single vector feature. This feature vector helps in measuring similarities between images by forming an efficient representation of face. In this process the Face recognition and detection is done using Open CV on Raspberry Pi 2.

Keywords: Cascade Classifier, Feature extraction, Local Binary Pattern (LBP), Feature matching, Classification, Histogram, Open CV

INTRODUCTION

The surveillance became a big challenging problem in the present world, sake of security purpose in phone or banks or other public places we are using many different security systems such as password, finger prints and pattern recognitions.

The pattern or passwords used can be trapped easily once if the user is known well or if the pattern is seen once or well known. The finger

print system doesn't achieve full-fledged result the through put is low because of the miss matches or a layer of distraction due to external sources and many other reasons. To provide a proper surveillance we are going for face recognition, the unique features of each individual are taken into consideration. There are different kinds of methods for face detection and recognition, in this paper face detection is done based on haar features and face recognition is done based on local binary pattern histogram. In

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this paper the Face recognition and detection is done using Open CV on to the Raspberry Pi 2.

Face Detection

Many kinds of face detections are used in plenty appliance occurrence management, surveillance eventualities, gaming, human-computer interaction, etc. Viola associated Jones devised an formula, known as haar features classifiers, to chop-chop find any object, as well as human faces, victimization Haar classifier cascades that area unit supported Haar-Like options. Different types of ways area unit out there for detecting the face for identification and recognition.

Face detection is using haar like features, so we'll work with face detection. Initially, the formula lots of positive pictures (images of faces) and negative pictures (images while not faces) to coach the classifier. Then we'd like to extract options from it. For these, haar features shown in image area unit used. Which are similar to our convolutional kernel. There are line features, edge features and rectangle features.

Face Recognition

Face recognition applications is categorized into the three categories: verification, identification and watch. Face confirmation part is considered to be a one. The system can compare face image to the face image(s) of a similar registered identity within the information to form callon whether declining or not acceptive the identity claim. In distinction, the face identification task may be a one: N matching drawback.

The face image is conferred to the system while not associate degree mark claim and also the system can search through the existing identities within the information of face to compare the conferred face image. Usually, it's considered that the conferred face image belongs to at least

one of the themes within the information. Lastly, the watch list task is typically very just like the identification task. but in watch list task, the question subjects square measure usually larger than the themes within the information and thus the question subject might not exist within the information.

LITERATURE SURVEY

In recent research areas point of view faces in images and videos have easily identified and localized. So to propose a fully automated system we need an efficient and robust face detection method. In given class to find position and size of object we are going for many robust techniques. There are many challenges such as size color shape and texture of human face.

There many kinds of face detection

- Knowledge based
- Feature invariant technique
- Template matching method
- Appearance based technique
- Color based technique
- Adaboost face detector

ADABOOST FACE DETECTOR

Adaboost is machine learning based technique which is highly accurate prediction based upon the relatively weak predictions or rules. The Adaboost algorithm consist of too many weak classifier which are cascaded to farm a strong positive classifier, the frontal face is detected based upon the features which are given to classifiers such as eyes edges and nose, etc. This is robust to many features such as angle and especially light.

Face Recognition

Multi resolutions faces recognition is challenging area of growing interest in multiple applications and appropriate classifier should be used which is robust to illumination and angles and color textures.

- LBPH it is acronym for the Local Binary Pattern Histogram technique.
- SIFT it is acronym for Scale Invariant Features Transform.
- SVM it is acronym for Support Vector Machine.
- EIGEN Face Recognition using Eigenvalue from the features.
- FISHER Faces it is combination of max variance of data.
- PCA it is acronym for Principle Component Analysis.

LOCAL BINARY PATTERN HISTOGRAM TECHNIQUE

Fisher faces and Eigen faces are comprehensive Techniques to face recognition. The pixels are the vector of the data some point in High dimensional vector space.

High dimensional vector space gives some ambiguity during face recognition. So, we go for the sub space which are lower dimensions and space where the useful data is stored. Total scatter is maximum In Eigen faces approach if the variance is calculated using external sources it may create a problem. Maximum variance components are not useful for the purpose face recognition, so to store some discriminate data we used a linear discrimination analysis and escalation in the fisher face method. In Fisher face we have to go for N number of data base if we have only one image the co variance will be very high and the through put is reduced.

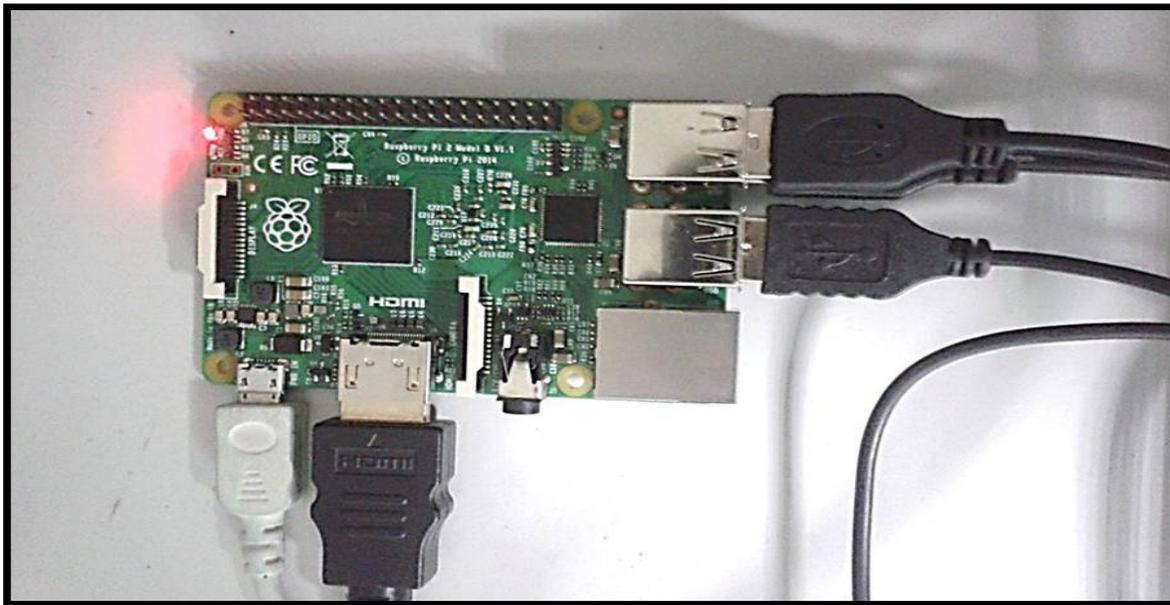
Hardware and Software

Raspberry PI

Raspberry Pi is a credit-card sized small microcomputer, Raspberry Pi Foundation, UK developed it. The aim of this single board computer is to teach the basics of programming and computer science to school students all over the world. Raspberry Pi developed in two versions, Model A and B. We can observe some similarities between these models like Model A is cheaper than Model B, Model A has 256MB memory and with single USB port also without a Ethernet port. Model B comes with two USB ports, 512MB memory and an Ethernet port.

There are many important hardware parts in Raspberry Pi with some useful functions. The Processor is the part of Raspberry Pi. Each Raspberry Pi includes a Broadcom BCM2835 chip which incorporates an ARM 7 CPU core. The chip is a 32-bit system and clock speed of 700 MHz. It also has a SD card acts as a storage media. Including the operating system and other important files are stored in the SD card. For video and audio the HDMI cable is used. For visual information a status LED is present in Raspberry Pi. The SD card is accessed by the first green light also the full duplex network is indicated by the second green LED and the link activity is indicated by the third green LED. The power of 3.3 V is indicated by red light and 100 Mbps network connection is shown with the yellow LED.

The Raspberry Pi is powered up with 5 V DC with a micro USB. For video output the device has a RCA composite video connector also for audio output a 3.5 mm stereo jack. 26 GPIO pins are present in Raspberry Pi which are able to connect expansion boards and low level peripherals. Raspberry Pi has two operating systems they are Debian and Jessie.

Figure 1: Shows the Ports of Raspberry Pi

The row of GPIO pins are the main feature of Raspberry Pi across the top edge of the board which are the physical interface between the outside world and the Raspberry Pi. Out of the 40 pins the GPIO pins are 26 and the remaining pins are ground or power pins.

SOFTWARE

OpenCV

OpenCV (Open Source Computer Vision) is a bunch of programming functions which is used for real-time computer vision, developed by Intel's research center which was supported by Willow Garage and Itseez is maintaining now. OpenCV was developed to bring a common platform for applications of computer vision and also accelerate the use of commercial products in machine perception. OpenCV makes easy for businesses to modify and utilize the code since it is a BSD-licensed.

More than 2500 algorithms are included in the library, which includes both machine learning algorithms and state of the art and classic computer vision. To identify objects, detect and recognize faces, classify human actions from videos, track moving objects, track camera movements, from stereo cameras produce 3D point clouds, extract 3D model of objects, to produce a high resolution image by stitching images of one entire scene, from image data base to find the similar images. Follow eye movements, red eyes which is appeared due use of flash can be removed, and many more can be developed using these algorithms.

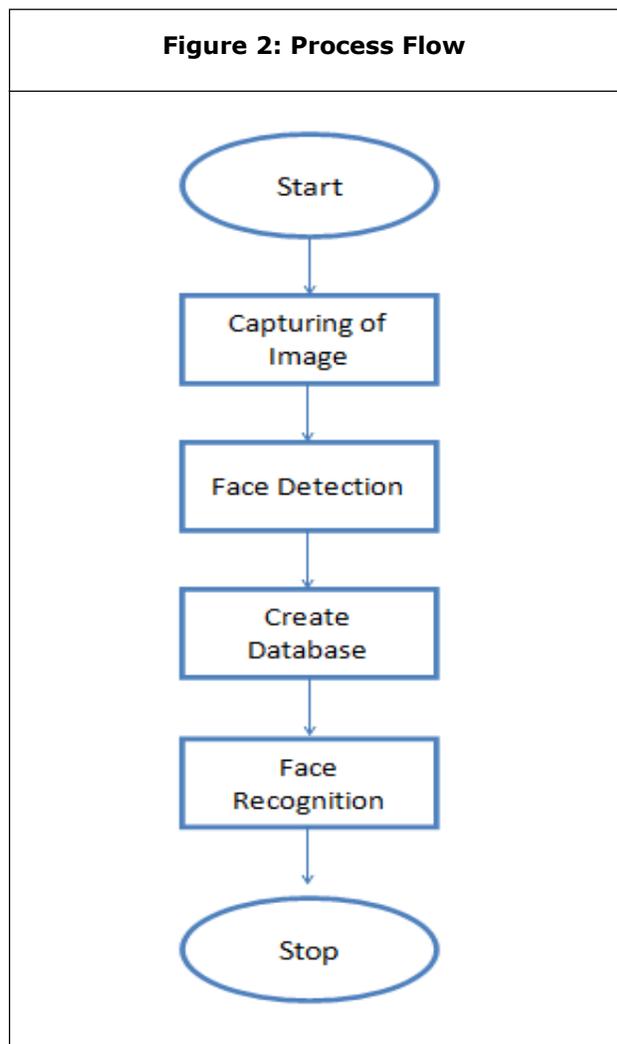
Which has C, C++, Java, Python and MATLAB interaction and Linux, Windows, Mac and Android OS are supported. OpenCV takes advantage of instructions like SSE and MMX and keep more interest in real time vision applications. The interfaces which are developed now are OpenCL and CUDA.

METHODOLOGY

LBPH considers texture descriptor which is useful to symbolize Faces. Because face data can be split as compositions of patterns of micro textures. Basically LBPH is carried out in 3 stages they are

1. Feature extraction,
2. Matching,
3. Classification

The face recognition is carried out as stages first stage the image capturing and converting into grey scale then the haar features are checked if the features are their then it is considered as face



if not non face, after that the pixels are mapped and checked the face.

RESULTS

The face detection and recognition is done using LBPH , the efficiency is up till 72% and the tilling of image is allowed till forty five degrees, the following images are the of face matched or recognized.

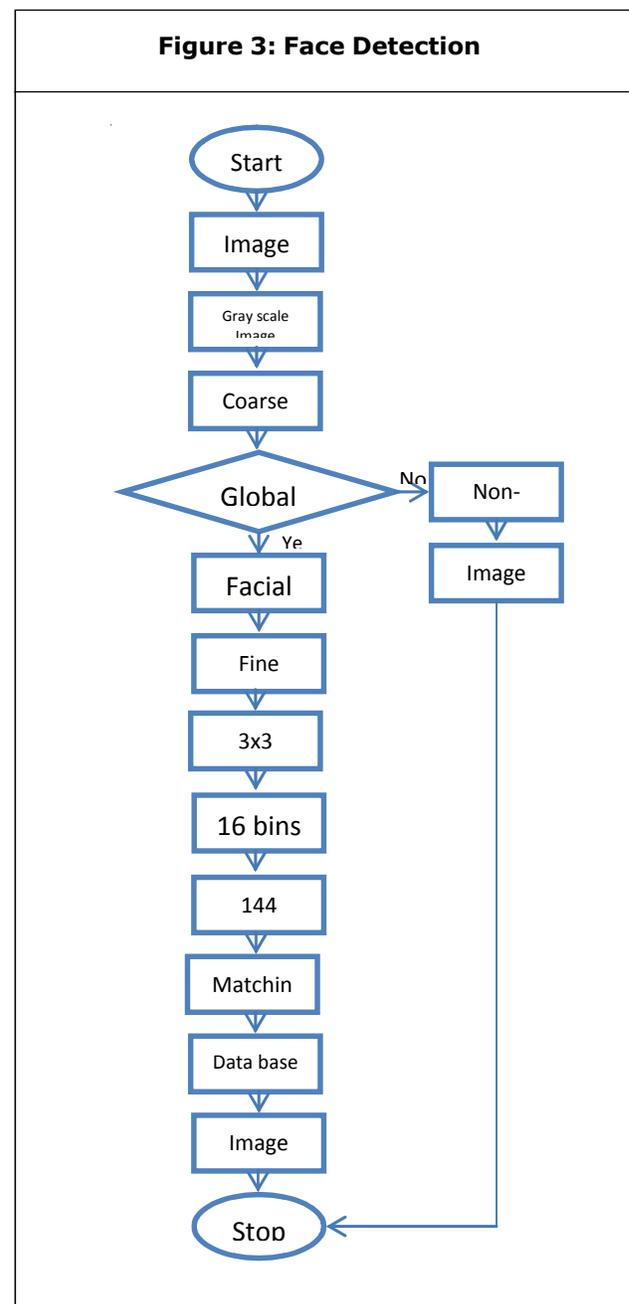


Figure 4: Face Detection and Hardware Setup

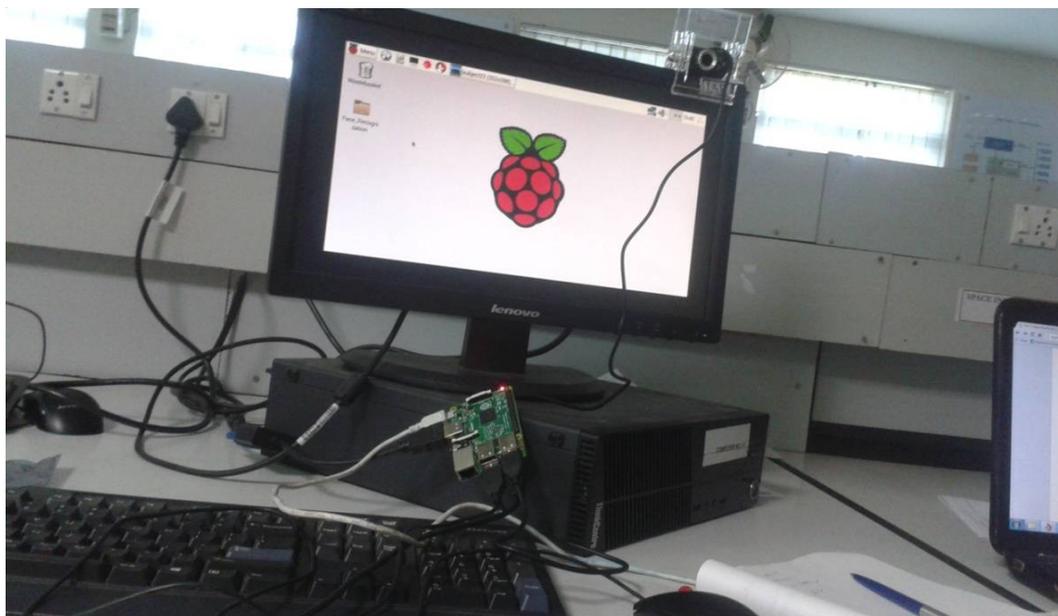
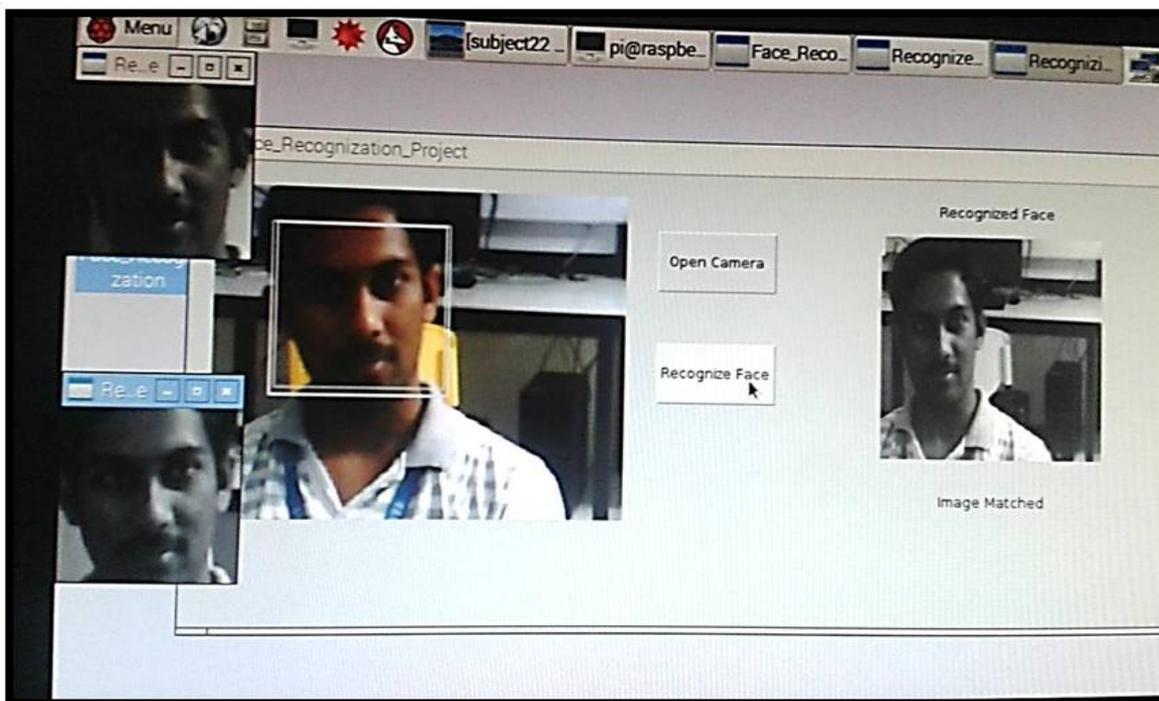


Figure 5: Face recognition



The below image is the face that should be recognized, the image is matched and in the right of the image is the utmost matched image, this is done using raspberry pi using openCV.

CONCLUSION

- The face recognition was done using LBPH and raspberry pi platform.
- To reduce the false-positives drastically and increase the efficiency in this research, we are using haar like features and for recognition of face we are using LBPH (local binary pattern histogram).
- This reference design can be used for authentication in banks , and other public places .
- Thus for a safety purpose in real time we designed a face recognition system in minimum expenses using raspberry pi, open cv and lbp algorithm.

FUTURE WORK

The future work is based on LBP but a bit improved one improved Local-Color-Vector Binary Pattern (LCVBP). The color images are taken and a improved bit of nine bit code is considered while as in LBP only eight bits are considered and in LBP there were only 256 labels but because of improved bit the bins or labels are increased to 512. The Gaussian distribution for multi variable is considered and multi blocks of lbp comes into picture and output which is matched with the data base (yaleb) will be in color.

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