

Face Recognition In Non-Uniform Motion Using Raspberry Pi

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Abstract: A face recognition system based on the Raspberry Pi is proposed in this paper. Face recognition system consists of detection and recognition of using Haar like feature based cascade classifier. Features of face are extracted using Eigen faces algorithm. Proposed architecture generates one full face review. The various areas in which face recognition system can be used are home automation for security purpose, employee login system, automatic student attendance etc. Digital image features of Haar used in object detection. Adjacent rectangular regions at a specific location in a detection window are considered, sums of the pixel intensities in each region and difference between these sums calculated. The subsections of an image are categorized using the difference between the sums. The proposed system has an image database with human faces. An observation is made that among all faces the region of the cheeks is brighter than region of eyes. So a common Haar like feature for face detection is a set of two adjacent rectangle. Speed of calculation is main advantage of a Haar like feature over most other features. Haar like feature of any size can be calculated in constant time due to the use of integral images.

Keywords: -Raspberry Pi, Haar feature, cascade classifier, Eigen faces algorithm.

I. INTRODUCTION

Face recognition is the process of putting a label to a known face. In over two decades face recognition has been one of the most interesting and important research fields. It is due to the need of automatic recognitions and surveillance systems, the interest in human visual system on face recognition, and the design of human computer interface, etc. These researches involve knowledge and researchers from disciplines such as neuroscience. A bunch of papers have been published to overcome difference factors (such as illumination, expression, scale, pose, etc) and achieve better recognition percentage. In this paper, general ideas and structures of recognition, important issues and factors of human faces, critical techniques and algorithms are discussed and finally a comparison and conclusion is given. Face recognition systems comes under security systems that are able to automatically detect and identify human faces. Face recognition systems depend on a recognition algorithm. But the most of the algorithm considers somewhat global data patterns while recognition process. This will not yield accurate detection and recognition system. The proposed

system will be developed so that it can be able to give accurate face detection and recognition.

Security and authentication of a person is a key part of any organization. Face recognition is one of the many techniques used for this purpose. It is an effective means of a human authentication the advantage of this approach is that, it makes easy to detect changes in the face pattern of an individual to a great extent. The recognition system can tolerate local variations in the face expression of an individual. So face recognition can be used as a key factor in crime detection mainly to identify criminals.

II. BACKGROUND

2.1 Existing System

Face recognition technology has evolved as a solution to address the needs in order to perform identification and verification of identity claims. A number of face recognition systems has been developed by improving the feature extraction methods and dimensionality reduction techniques in pattern recognition with high rate of success. MOBILAP is implemented in existing system. MOBILAP results on the Labeled Faces in the dataset using the unsupervised protocol. System also evaluates the performance of MOBILAP on our own real dataset captured using a camera that contains significant blur, illumination and pose variations.

2.2 Proposed System

The proposed system combines all the preceding steps into a self contained real time GUI program to allow immediate use of the face recognition system rather than providing a command line tool that processes image files in an offline manner, one should be able to modify the behavior of the system for your own purposes, such as to allow an automatic login of your computer or if you are interested in improving the recognition reliability then you can read conference papers about recent advances in face recognition to potentially improve each step of the program until it is reliable enough for your specific needs. For example, you could improve the face preprocessing stages, or use a more advanced machine learning algorithm, or an even better face verification algorithm.

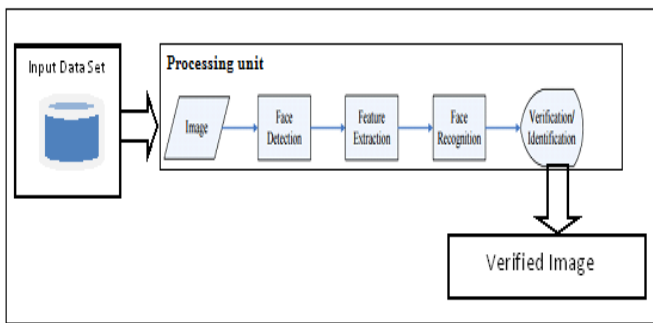


Fig.1. Proposed system

III. TECHNOLOGY & TECHNIQUES USED:

1) Raspberry Pi:-The Raspberry Pi is a low cost, credit card sized computer that can be attached into a computer monitor or TV, and uses a standard keyboard and mouse. It is a small device that enables people of all ages to learn computing, and to learn how to programming languages like Python. It is capable of doing everything you'd expect a desktop computer to do, from browsing the internet and playing HD video, to making spreadsheets, word processing, and playing games. The Raspberry Pi can interact with the outside world, and has been used widely in many applications. Raspberry Pi was build for kids all over the world to learn to program and understand how computers work.

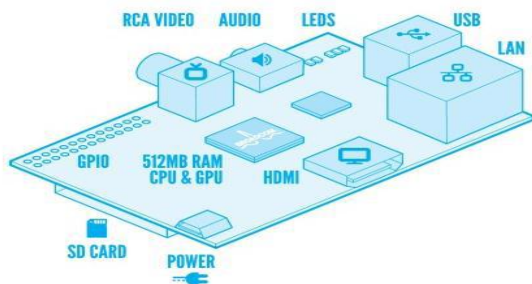


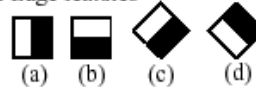
Fig. 2.Raspberry Pi Model B

2) OpenCV: - OpenCV is a library of programming functions mainly aimed at real time computer vision. It was originally developed by Intel research center in Russia, later supported by Willow Garage and now maintained by It seez. The library is cross platform and free for use under the open source BSD license. OpenCV is a machine learning software library. It provides an infrastructure for computer vision applications and accelerates the use of machine perception in the commercial products. It is a BSD licensed product therefore making it easy for businesses to utilize and modify the code. The library has more than 2500 optimized algorithms, which includes a both classic and state of the art computer vision

and machine learning algorithms. The algorithms can be used to detect and recognize faces, identify objects, classify human actions in videos, track camera movements, track moving objects, extract 3D models of objects, bind images together to produce a high resolution image of an entire scene, find similar images from an image database, remove red eyes from images taken using flash, follow eye movements,etc. According to a survey over 47 thousand people use OpenCV and estimated number of downloads exceeds 7 million. The library is used largely in companies, research groups and by governmental bodies.

3) Cascade Classifier:-The word cascade in the cascade classifier means that the resulting classifier consists of several simpler classifiers. They are applied subsequently to a region of interest until at some phase the candidate is rejected. Cascade classifier supports boosting. At present stage Discrete Adaboost, Real Adaboost, Gentle Adaboost and Logitboost are supported. Decision tree classifiers with at least 2 leaves are basic classifiers. The inputs to the basic classifiers are HAAR like features, and are calculated as described below. The current algorithm uses the following Haar like features:

1. Edge features



2. Line features



3. Center-surround features



Cascade Classifier	Reliability*	Speed**
haarcascade_mcs_lefteye.xml	80%	18 msec
haarcascade_lefteye_2splits.xml	60%	7 msec
haarcascade_eye.xml	40%	5 msec
haarcascade_eye_tree_eyeglasses.xml	15%	10 msec

Table.1.Cascade Classifier reliability and speed

IV. DESIGN

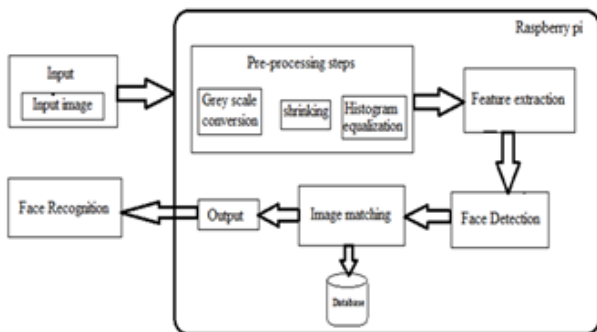


Fig.3. System Architecture

A face recognition system is a computer application capable of identifying or verifying a person from a digital image. Description of process is given as follows:

1. Image:-

It is the image which is distorted and need processing or we can say that these are the images present in test set and training set to test the Face Recognition System.



Fig.3. Image preprocessing steps

2. Face Detection:-

The key function of face detection step is to determine whether human faces appear in a given image and location of the faces. Patches containing each face in the input image is the expected output of this step. This makes face recognition system easy to design. Face alignment are performed to justify orientation of patches. Face detection could also be used for video and image classification, etc.

3. Feature Extraction:-

In feature extraction step, patches of human face are extracted from images after face detection. These patches of face are directly used for face recognition which gives unfavorable results. This is because each patch usually

contains over 1000 pixels, which are too large to build well made recognition system. Face patches may be taken from different camera alignments, illuminations, and may suffer from occlusion and clutter. Feature extractions are performs information packing, dimension reduction, silence extraction, and noise cleaning. After this step, a face patch is usually transformed into a vector with fixed dimension and their corresponding locations. Feature extraction can either included in face detection step or face recognition step.

4. Face Recognition:-

After formulating the representing each face, the last step is to recognize the identities of these faces. A face database is required to build to achieve automatic recognition. Several images are taken for each person and their features are extracted and stored in the database. Then comparison of features to each face class stored in the database is done.

5. Verification & Identification:-

There have been many researches and algorithms proposed to deal with this classification problem. Verification and identification are two general applications of face recognition. If given a face image, we want the system to tell who the person is or the most probable identification is this is called to face identification and if given a face image and a guess of the identification and we want the system to tell true or false about the guess this is called verification.

V. CONCLUSION

This paper has shown all the steps required to create a real time face recognition system just using basic algorithms. We used face detection to find the location of a face within the camera image, followed by several forms of face preprocessing to reduce the effects of different lighting conditions, camera and face orientations. We then trained an Eigen faces machine learning system with the preprocessed faces we collected, and finally we performed face recognition.

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