Automatic Face Recognition Techniques using LBPH.

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Abstract

Given a collection of images, where each image contains several faces and is associated with a few names in the corresponding caption, the goal of face naming is to infer the correct name for each face. Due to social web portals and social networks, web users are motivated to share their pictures over the internet and that permit other users to tag and comment on the pictures. Many people share their posts, images on social portals, many are been labeled with appropriate names but many are not labeled, which becomes hard to understand the names for an unknown individual person. In this task, we need an efficient facial recognition (FR) system that can recognize everyone in the photo. However, more demanding privacy setting may limit the number of the photos publicly available to train the FR system. To deal with this dilemma, our mechanism attempts to utilize users' private photos to design a personalized FR system specifically trained to differentiate possible photo co-owners without leaking their privacy. We also develop a distributed consensus based method to reduce the computational complexity and protect the private training set. We show that our system is superior to other possible approaches in terms of recognition ratio and efficiency.

Keywords: *Automatic image annotation; Automatic face annotation; feature extraction, Cascade Classifier, Feature extraction, Local Binary Pattern (LBP), Feature matching, Classification, Histogram, Open CV Local Binary Pattern.*

I. 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. Encryption and information hiding are two viable method for information security. While the encryption procedures change over plaintext content into mixed up ciphertext, the information concealing strategies insert extra information into spread media by presenting slight alteration 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 features and face recognition is done based on local binary pattern histogram. Facial expression is one of the most powerful, natural and immediate means for human beings to communicate their emotions and intensions. Face recognition is an interesting and challenging problem, and impacts important applications in many areas such as identification for law enforcement, authentication for bankingand security system access, and also personal identification among others. The face plays a major role in our social intercourse in conveying identity and emotion. The human ability to recognize faces is remarkable. Face recognition has always a major focus of research because of its noninvasive nature and because it is peoples primary method of person identification.

II. PROJECT OBJECTIVE

This project is intended to identify a person using the images previously taken. The identification will be done according the previous images of different persons

III. RELATED WORK

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.

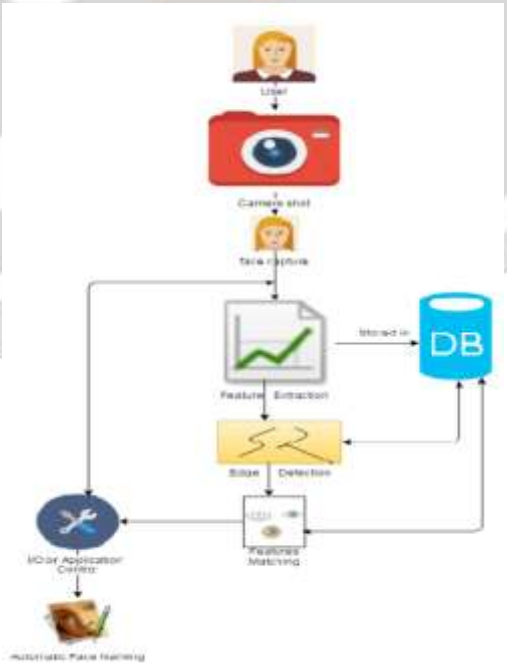
Face Recognition :

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.

IV SYSTEM ARCHITECTURE

1) Internal software data structure:

When SQLite/SQL returns there results of the query sent to it by XML And JAVA ,the results of the query will be passed back to XML using the built in data structures.



1.2 Global data structure

We are not using any global data structures at this time.

1.3 Temporary data structure

We will be using a cookie saved on the users machine to temporarily store the users query entry. This is so the user can go back to the query page and easily modify their last query to refine or widen their search as needed

1.4 Data base description
A database will be used to store all of the user data. The database is made up of no of tables. User, Location, Transaction, etc.

IV. 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.

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. 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.

V. 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. Today we gonna talk about one of the oldest (not the oldest one) and more popular face recognition algorithms: **Local Binary Patterns Histograms (LBPH)**.

Local Binary Pattern (LBP) is a simple yet very efficient texture operator which labels the pixels of an image by thresholding the neighborhood of each pixel and considers the result as a binary number. It was first described in 1994 (LBP) and has since been found to be a powerful feature for texture classification. It has further been determined that when LBP is combined with histograms of oriented gradients (HOG) descriptor, it improves the detection performance considerably on some datasets. Using the LBP combined with histograms we can represent the face images with a simple data vector. As LBP is a visual descriptor it can also be used for face recognition tasks, as can be seen in the following step-by-step explanation.

1) Step-by-Step

Now that we know a little more about face recognition and the LBPH, let's go further and see the steps of the algorithm:

1. **Parameters**: the LBPH uses 4 parameters:

- **Radius**: the radius is used to build the circular local binary pattern and represents the radius around the central pixel. It is usually set to 1.
- **Neighbors**: the number of sample points to build the circular local binary pattern. Keep in mind: the more
- sample points you include, the higher the computational cost. It is usually set to 8.

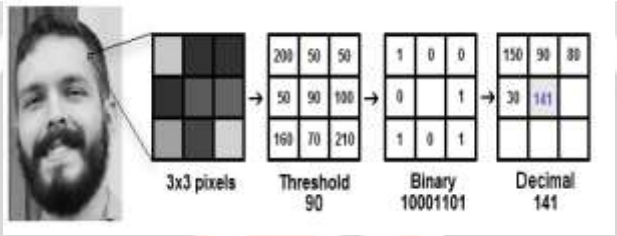
- **Grid X**: the number of cells in the horizontal direction. The more cells, the finer the grid, the higher the dimensionality of the resulting feature vector. It is usually set to 8.

- **Grid Y**: the number of cells in the vertical direction. The more cells, the finer the grid, thehigher the dimensionality of the resulting feature vector. It is usually set to 8.

2. Training the Algorithm: Here, we need to use a dataset with the facial images of the people we want to recognize. We need to also set an ID (it may be a number or the name of the person) for each image, so the algorithm will use this information to recognize an input image and give you an output. Images of the same person must have the same ID. With the training set already constructed, let's see the LBPH computational steps.

3. Applying the LBP operation: The first computational step of the LBPH is to create an intermediate image that describes the original image in a better way, by highlighting the facial characteristics. To do so, the algorithm uses a concept of a sliding window, based on the parameters **radius** and **neighbors**.

The image below shows this procedure:



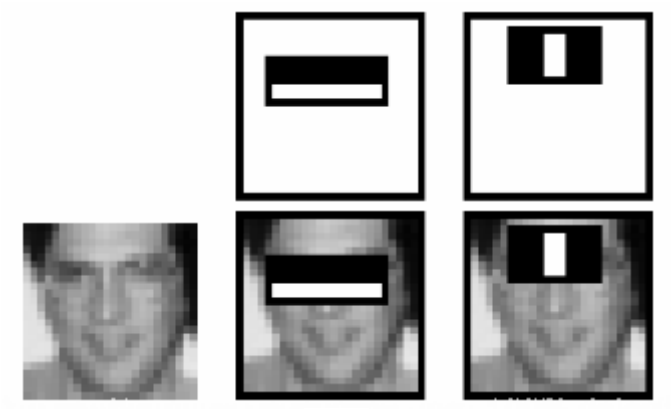
2. Open CV library

OpenCV (Open Source Computer Vision Library) is an open source computer vision and machine learning software library. OpenCV was built to provide a common infrastructure for computer vision applications and to accelerate the use of machine perception in the commercial products. Being a BSD-licensed product, OpenCV makes it easy for businesses to utilize and modify the code.
It has C++, Python, Java and MATLAB interfaces and supports Windows, Linux, Android and Mac OS. OpenCV leans mostly towards real-time vision applications and takes advantage of MMX and SSE instructions when available. A full-featured CUDA and OpenCL interfaces are being actively developed right now. There are over 500 algorithms and about 10 times as many functions that compose or support those algorithms. OpenCV is written natively in C++ and has a templated interface that works seamlessly with STL containers.

3. ***Haar-cascade Detection in OpenCV***

we will work with face detection. Initially, the algorithm needs a lot of positive images (images of faces) and negative images (images without faces) to train the classifier. Then we need to extract features from it. For this, Haar features shown in the below image are used. They are just like our convolutional kernel. Each feature is a single value obtained by subtracting sum of pixels under the white rectangle from sum of pixels under the black rectangle.

For example, consider the image below. The top row shows two good features. The first feature selected seems to focus on the property that the region of the eyes is often darker than the region of the nose and cheeks. The second feature selected relies on the property that the eyes are darker than the bridge of the nose. But the same windows applied to cheeks or any other place is irrelevant. So how do we select the best features out of 160000+ features?



image

For this, we apply each and every feature on all the training images. For each feature, it finds the best threshold which will classify the faces to positive and negative. Obviously, there will be errors or misclassifications. We select the features with minimum error rate, which means they are the features that most accurately classify the face and non-face images. (The process is not as simple as this. Each image is given an equal weight in the beginning. After each classification, weights of misclassified images are increased. Then the same process is done. New error rates are calculated. Also new weights. The process is continued until the required accuracy or error rate is achieved or the required number of features are found).OpenCV comes with a trainer as well as detector. If you want to train your own classifier for any object like car, planes etc. you can use OpenCV to create one. Here we will deal with detection. OpenCV already contains many pre-trained classifiers for face, eyes, smiles, etc. Those XML files are stored in the opencv/data/haarcascades/ folder.

VI 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. LBPH is one of the easiest face recognition algorithms.It can represent local features in the images.It is possible to get great results (mainly in a controlled environment).It is robust against monotonic gray scale transformations. It is provided by the OpenCV library (Open Source Computer Vision Library).

VI. 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

VII. REFERENCES

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