Face Recognition and Suspect Identification System

Mrunal Mukund Paramane, Rajashree Ramchandra Dhake, Maheshwari Prashant Kale, Prof. Shwetkranti Tawhare
Indira College of Engineering and Management.

Abstract:

There is an abnormal increase in the crime rate and also the number of criminals is increasing, this leads towards a great concern about the security issues. Crime preventions and criminal identification are the primary issues before the police personnel, since property and lives protection are the basic concerns of the police but to combat the crime, the availability of police personnel is limited. With the advent of security technology, cameras especially CCTV have been installed in many public and private areas to provide surveillance activities. The footage of the CCTV can be used to identify suspects on scene. In this paper, an automated facial recognition system for criminal database was proposed using Voila Jones and LBP Algorithm. This system will be able to detect face and recognize face automatically in real time. An accurate location of the face is still a challenging task. Viola-Jones framework has been widely used by researchers in order to detect the location of faces and objects in a given image. Face detection classifiers are shared by public communities.

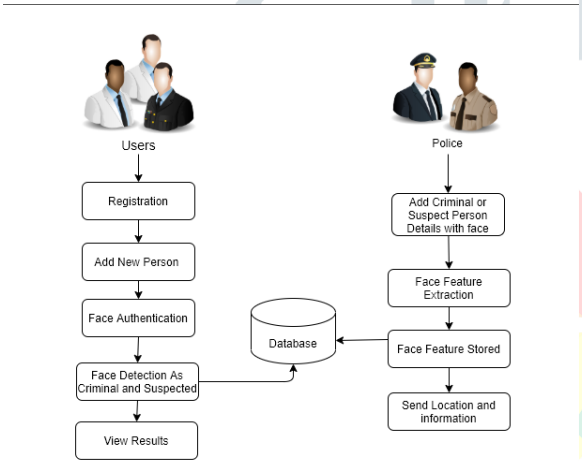
Keywords: Face Search, Face recognition, Criminal Detection Facial Recognition, Viola-Jones, LBP-Linear Binary Pattern, Location (latitude, Longitude)

1. Introduction:

The face is crucial for human identity. It is the feature which best distinguishes a person. Face recognition is an interesting and challenging problem and impacts important applications in many areas such as identification for law enforcement, authentication for banking and security system access, and personal identification among others. Face recognition is an easy task for humans but it's entirely different task for a computer. A very little is known about human recognition to date on How do
we analyze an image and how does the brain encode it and Are inner features (eyes, nose, mouth) or outer features (head shape, hairline) used for a successful face recognition Neuro physiologist David Hubel and Torsten Wiesel has shown that our brain
has specialized nerve cells responding to specific local features of a scene, such as lines, edges, angles or movement. Since we don't see the world as scattered pieces, our visual cortex must somehow combine the different sources of information into useful patterns. Automatic face recognition is all about extracting those meaningful features from an image, putting them into a useful representation and performing some classifications on them. Face recognition based on the geometric features of a face is probably the most instinctive approach for Human identification. The whole process can be divided in three major steps where the first step is to find a good database of faces with multiple images for each individual. The next step is to detect faces in the database images and use them to train the face recognizer and the final step is to test the face recognizer to recognize faces it was trained for. Nowadays, face detection is used in many places especially the websites hosting images like Picassa, Photo bucket and Facebook. The automatically tagging feature adds a new dimension to sharing pictures among the people who are in the picture and also gives the idea to other people about who the person is in the image. In our project, we have studied and implemented a pretty simple but very effective face detection algorithm which takes human skin color into account. Our aim, which we believe we have reached, was to develop a system that can be used by police or investigation department to recognize criminal from their faces. The

method of face recognition used is fast, robust, reasonably simple and accurate with a relatively simple and easy to understand algorithms and technique. Face identification is defined in three steps (1)face detection (2) feature extraction (3)face recognition. Camera configuration is very important to track moving persons and recognize[2] them precisely. Facial feature points encode critical information about face shape. Precise location and facial feature points tracing are important. Each feature point is usually detected and traced by performing a local search for the better matching position[3]. There are very less researches on face recognition using edge-based.

2. Architecture Diagram



System Architecture

3. Literature Survey:

1)Paper Name: Person Re-identification by Local Maximal Occurrence Representation and Metric Learning.

Author: Shengcai Liao, Yang Hu, Xiangyu Zhu, and Stan Z. Li.

Description: Person re-identification is an important technique towards automatic search of a person's presence in a surveillance video. Two fundamental problems are critical for person re-identification, feature representation and metric learning. An effective feature representation should be robust to illumination and viewpoint changes, and a discriminant metric should be learned to match various person images. In this paper, we propose an effective feature representation called Local Maximal Occurrence (LOMO), and a subspace and metric learning method called Cross-view Quadratic Discriminant Analysis (XQDA). The LOMO feature analyzes the horizontal occurrence of local features, and maximizes the occurrence to make a stable representation against viewpoint changes.

2)Paper Name: Object and Action Classification with Latent Window Parameters

Author: Hakan Bilen, Vinay P. Namboodiri, · Luc J. Van Gool

Description: In this paper we propose a generic framework to incorporate unobserved auxiliary information for classifying objects and actions. This framework allows us to automatically select a bounding box and its quadrants from which best to extract features. These spatial subdivisions are learnt as latent variables. The paper is an extended version of our earlier work Bilen et al. (Proceedings of The British Machine Vision Conference, 2011), complemented with additional ideas, experiments and analysis. We approach the classification problem in a discriminative setting, as learning a max-margin classifier that infers the class label along with the latent variables.

3)Paper Name: Object Detection with Discriminatively Trained Part-Based Models

Author: Pedro F. Felzenszwalb, Ross B. Girshick, David McAllester

Description: Our system is able to represent highly variable object classes and achieves state-of-the-art results in the PASCAL object detection challenges. While deformable part models have become quite popular, their value had not been demonstrated on difficult benchmarks such as the PASCAL data sets. Our system relies on new methods for discriminative training with partially labeled data. We combine a margin sensitive approach for data-mining hard negative examples with a formalism we call latent SVM. A latent SVM is a reformulation of MI-SVM in terms of latent variables. A latent SVM is semi convex, and the training problem becomes convex once latent information is specified for the positive

examples. This leads to an iterative training algorithm that alternates between fixing latent values for positive
examples and optimizing the latent SVM objective function.

4.Paper Name: Semi-supervised Learning with Constraints for Person Identification in Multimedia Data
Author: Martin Bauml, Makarand Tapaswi, Rainer Stiefelhagen
Description: We address the problem of person identification in TV series. We propose a unified learning framework for multiclass classification which incorporates labeled and unlabeled data, and constraints between pairs of features in the training. We apply the framework to train multinomial logistic regression classifiers for multi-class face recognition. The method is completely automatic, as the labeled data is obtained by tagging speaking faces using subtitles and fan transcripts of the videos. We demonstrate our approach on six episodes each of two diverse TV series and achieve state-of-the-art performance.

5. **Paper Name**: Person re-identification in TV series using robust facerecognition and user feedback.
Author: Mika Fischer· Hazım Kemal kenel· Rainer Stiefelhagen
Description: In this paper, we present a system for person re-identification in TV series. In the context of video retrieval, person re-identification refers to the task where a user clicks on a person in a video frame and the system then finds other occurrences of the same person in the same or different videos. The main characteristic of this scenario is that no previously collected training data is available, so no person specific models can be trained in advance. Additionally, the query data is limited to the image that the user clicks on. These conditions pose a great challenge to the re-identification system, which has to find the same person in other shots despite large variations in the person's appearance. In the study, facial appearance is used as the re-identification cue, since, in contrast to surveillance-oriented re-identification studies, the person can have different clothing in different shots. In order to increase the amount of available face data, the proposed system employs a face tracker that can track faces up to full profile views. This makes it possible to use a profile face image as query image and also to retrieve images with non-frontal poses. It also provides temporal association of the face images in the video, so that instead of using single images for query or target, whole tracks can be used. A fast and robust face recognition algorithm is used to find matching faces. If the match result is highly confident, our system adds the matching face track to the query set. Finally, if the user is not satisfied with the number of returned results, the system can present a small number of candidate face images.

3. Motivation of Project:

In this paper to detect and localize a target person of interest (a friend) in a test image. The challenge that is addressed here is to resolve the ambiguity in person identification when we are provided with only information regarding presence or absence of the person in an image. In order to learn a classifier from this dataset, we need to address the issues associated with it. One could run a person detector and obtain bounding boxes corresponding to persons or face-detection and bounding boxes corresponding to faces. Face is detected using the Viola Jones face detector. Viola Jones algorithm is helpful for detecting face and easy to find the information about that image.

5.Objectives of the project:

The main goal we present a method that aims to solve this problem in real world conditions where the person can be in any pose, profile and orientation and the face itself is not always clearly visible. Moreover, we show that the problem can be solved with as weak supervision only a label whether the person is present or not, which is usually the case as people are tagged in social networks. This is challenging as there can be ambiguity in association of the right person.

6. Proposed System:

Our Proposed System is to detect and localize a target person of interest (a friend) in a test image. The challenge that is addressed here is to resolve the ambiguity in person identification when we are provided with only information regarding presence or absence of the person in an image. In

order to learn a classifier from this dataset, we need to address the issues associated with it. One could run a person detector and obtain bounding boxes corresponding to persons or face-detection and bounding boxes corresponding to faces. However, there would be two kinds of ambiguity present. One kind of ambiguity lies in that of deciding which of the bounding boxes in each image corresponds to the friend. The second kind of ambiguity lies in that in order to ensure robust detection of persons we would be lowering the detection threshold and some of the bounding boxes would indeed not correspond to a person at all. Thus the two ambiguities can be termed the data association ambiguity and the ambiguity arising from classification accuracy. In order to resolve both these ambiguities we rely on a principled framework where we simultaneously resolve the location and classification of the person. This is achieved by formulating the solution of the problem in terms of a principled max-margin framework where the location is treated as a latent variable. The problem can then be solved by using a latent support vector machine.

7. Algorithm: Viola Jones algorithm

1. The Viola–Jones object detection framework is the first object detection framework to provide competitive object detection rates in real-time proposed in 2001 by Paul Viola and Michael Jones. Although it can be trained to detect a variety of object classes, it was motivated primarily by the problem of face detection.
2. Viola-Jones algorithm is real-time face detection system. A face detection algorithm must possess two key features, accuracy and speed.
3.There are three ingredients working in concert to enable a fast and accurate detection: the integral image for feature computation,Adaboost for feature selection and an intentional cascade for efficient computational resource allocation.

9.Conclusion:

In this project, we can detect and recognize faces of the criminals in a video stream obtained from a camera in real time. We have used Vailo Jones and LBP Recognition for face detection. It is a machine learning based approach where function is trained from a lot of Images. It is then used to detect objects in other images. Also, we have used Local Binary Patterns Histograms (LBPH) for face recognition. Several advantages of this algorithm are: Efficient selection of features, Scale and location invariant detector, instead of scaling the image itself, we scale the features. LBPH recognizer can recognize faces in different lighting conditions with high accuracy. Also, LBPH can recognize efficiently even if single training image is used for each person. The real-time automated face detection and recognition system proposed would be ideal for crowd surveillance applications.

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