DYNAMIC FACE RECOGNITION AND TRACKING SYSTEM USING MACHINE LEARNING IN MATLAB AND BIGDATA

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Submitted: May 27, 2017 ***Accepted: June 15, 2017*** ***Published: Sep 1, 2017***

Abstract- Face Recognition being one of the methods in identifying individuals is getting enhanced at a faster rate. This paper demonstrates the process of detection of faces of the individuals through a live monitoring camera using matlab and also aids in tracking them. The large amount of images being collected at each second is stored in big databases like Hadoop- databases(hbase) or Mongodb as they are known for their higher processing speed. The facial features are extracted from all the images and are trained into the databases using machine learning algorithm. The tracking of individuals can be achieved by capturing their images while on the move and comparing them with the values stored in the databases. The detection of facial structure is done with Viola-Jones algorithm which though older is easy and efficient to use and Kanade-Lucas-Tomasi(KLT) algorithm is used for feature extraction . The HOG (Histogram of Oriented Gradients) features are extracted for training.

Index terms*:* Cascade object detector, Computer vision, Face detection, Face recognition, Big data, Neural networks.

I. INTRODUCTION

Face recognition is advancing as the main technique besides biometric identification in security surveillance and it has engrossed developers to engage in a huge area of research. Several methods have been proposed in recognising faces from static images as well as in real time environment with different efficiencies and speed. Paul Viola and Michael Jones in the year 2001 proposed Viola Jones Algorithm [2] which is still the widely used one due to its simplicity and accuracy in detecting faces. The Cascade Object under computer vision toolbox is used to detect faces and other facial features like eyes, mouth, and nose with the help of built-in methods.

Databases like hbase of hadoop or mongodb which can store large amount of unstructured data are used, keeping in mind their efficiency and computational time. Though several databases like at&t database, yale database [6] with a set of preloaded images are available, their capacity is limited in this data engulfed world. The features from the captured images are extracted through KLT (Kanade-Lucas-Tomasi) [2] algorithm and the histogram is built from which HOG (Histogram of Oriented Gradients) features can be calculated and stored into the databases. The images are continuously passed and the neural networks are trained with sufficient image sets so that the module works with increased efficiency and less false negatives. This paper further uses methods for tracking the individual among a group. Let us now see the various modules in this technique.

This paper is divided into two phases as training phase and testing phase. The training phase consists of face detection and storing in database. The testing phase consists of face recognition and tracking.

II. Face Detection Vs Face Recognition

Face Detection is different from Face Recognition. Face Detection is the concept of detecting the faces from the given image, either it be an individual image or a group image. The face detection can be done by cascade object detector in matlab along with other set of facial features like face, mouth, nose, and distance between these features, whereas Face Recognition is one where the faces are recognised for its presence in the database.

There are several face detection methods like Viola-Jones face detector, Local Binary Patterns, Neural Network based detection etc. And face recognition can be done by calculating the Eigen face values simply called as Eigen faces, fisher faces, or by using line edge map results.

III. Existing System

Faces are detected based on the geometric locations of the facial features and the distance between them [7]. The skin tone and hair colour are used as additional constraints for matching the faces. [5]Faces are detected from the videos by extracting features based on eigen faces and their corresponding eiges vectors. The pose changes are detected using gabor filters. [1]Recognising faces by extracting features and comparing with artificial neural networks.

IV. System Architecture

Figure 1 gives a brief outline about the architecture of the entire system. It consists of two blocks one for training and another for testing. The training block consists of three steps i)image is captured using a camera, ii)features are extracted by suitable algorithms, iii)features are fed into neural networks and are stored into database. The testing block consists i)image capturing using a camera, ii)feature extraction and iii)compared with data extracted from database.

The main feature in this paper is the usage of big databases along with matlab combined with neural networks, these when used together increase the efficiency and speed of processing and accuracy in recognising images.

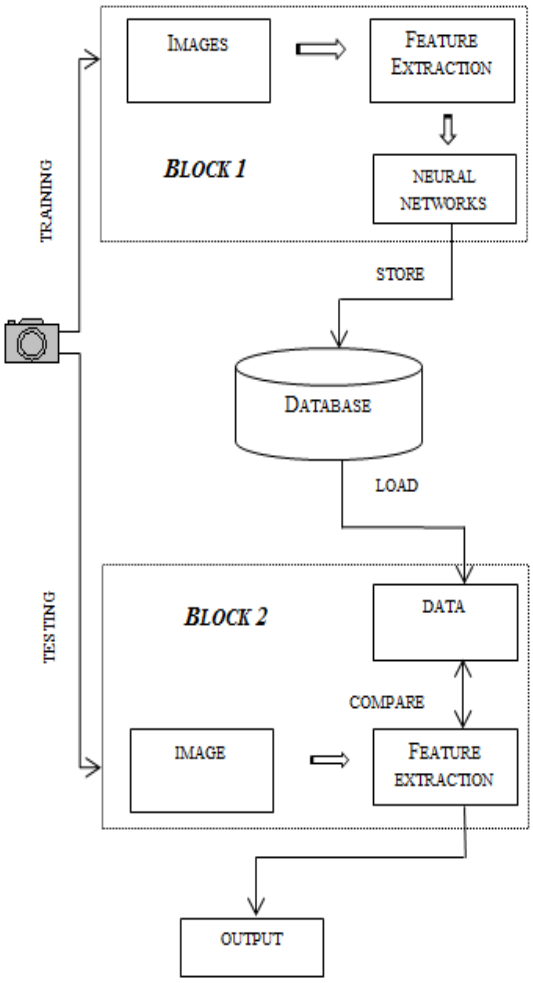

Figure1. Basic Architecture Diagram Of The Entire System

Let us divide the entire process into two methodologies:

V. Training

5.1. Image Capturing

We use a camera for the process of acquisition of live feed. This live feed is processed at certain intervals to extract the images at various angles and then these images are sent to the matlab where it is stored in an array.

5.2.Face Detection

The faces from the captured images can be detected using cascade object detector proposed in Viola Jones algorithm. In addition other features like mouth, eyes, nose are also detected with their corresponding cascade object detector methods. Thedetected faces are cropped along their bounding boxes and are now ready for the feature extraction process.

5.3. Feature Extraction

Now the features are extracted from the cropped images as specified in the standard "good features to track"[3] algorithm. The histogram is constructed with the obtained points. The HOG features are obtained for the respective images and these are then sent to the neural networks.

Figure2. Hog Features

5.4.Neural Networks

The feed of points obtained from the above step is then used for training by the networks and then the points are stored in the Hadoop database. More training gives more accurate results when comparing. So sufficient amount of images are trained and the data is sent to the database for storage.

5.5.Storing in the database

The data is stored in the database in columns along with the person names or numbers which are later used for identification. The sufficient training set of images for each person is stored in the database.

Figure3. Trained Set of a Single Person

VI. Testing

6.1. Image Capturing

The previous step is all about training the database with neural networks. Now the actual phase of recognition and tracking begins. The images are captured now with the camera and then sent to the array variables for processing

6.2. Face Detection

The faces are detected using Viola-Jones algorithm as done in training phase and the detected faces are cropped along their bounding boxes, the images are now processed for feature extraction.

6.3. Feature Extraction

The facial features are extracted as in training phase with the help of extractHOGFeatures (image) method available in matlab and then are stored in a variable.

6.4. Load Database

The database with the data is loaded for access and the results are then used for comparison

6.5. Comparison

The image now captured is compared using the extracted features with those of features in the database, the image with the closest features are matched along with their names or numbers stopped in the database in the training phase

6.6. Face Recognition

Now the faces are recognised from the matching results and live tracking of these faces in the real time environment can be done using KLT algorithm. The final result is then obtained by following the two phases in an sequential manner.

Figure 4. Matching the Image with Database sets

VII. Algorithm

7.1.Training

Step1: Create a database in Hadoop.

Step2: Capture Images from a camera.

Step3: Detect faces in images using cascade objects, Crop them around bounding box.

Step4: Extract features using hog extract methods.

Step5: Training neural networks using machine learning algorithm.

Step6: Store in the Database.

Step7: Stop

7.2 Testing

Step1: Capture Image.

Step2: Detect faces in image using cascade objects, Crop them around bounding box.

Step3: Extract features using hog extract methods.

Step4: Load Database.

Step5: Compare Image, and match the close points.

Step6: Output the recognised faces.

Step7: Stop.Equations

VIII. Conclusion

This paper is about research work on the facere cognition using cascade object proposed by Viola Jones and dynamic face recognition using KLTalgorithm. This research can be further extended to be used in fields like security to find criminals by comparing with the security databases and dynamically recognise and track them among the public. Usage of bigdata ba se shells in storing and computing large amount of data.Training a large amount of images increases accuracy of recognising images.

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