Review of Face detection Algorithms

Face detection i.e the sub domain of object detection is one of the field based on computer-human interaction. Object Detection is a process that deal with detecting instances of objects from a particular class (such as people, cars, buildings or faces)in an image or video.

The face detection procedure is performed on an arbitrary image which determines the faces in an image by differentiating the patterns formed the faces from the other patterns and returns the dimensions of each face. This can be achieved if face modeling and face segmentation is done accurately. This also requires considering various aspects of facial appearance like pose, resolution, focus, noise,color, shadow and occlusion etc.

- **Local Binary Patterns Algorithm**

LBP features are extracted to form a feature vector that classifies a face from a non-face. Each training image is divided into some blocks. For each block, LBP looks at 9 pixels (3×3 window) at a time, and with a particular interest in the pixel located in the center of the window.

Then, it compares the central pixel value with every neighbor's pixel value under the 3×3 window. For each neighbor pixel that is greater than or equal to the center pixel, it sets its value to 1, and for the others, it sets them to 0.

After that, it reads the updated pixel values (which can be either 0 or 1) in a clockwise order and forms a binary number. Next, it converts the binary number into a decimal number, and that decimal number is the new value of the center pixel

- **Camshift Algorithm**

In camshift Algorithm color probability distribution varies accordingly to time . Maintaining proper size and location of the search window required . Camshift algorithm is used to adaptively meet that requirement. . 2D probability distribution image is employed .The back projection of the target histogram is produced by the

Camshift algorithm with image to process. Camshift algorithm includes other objects along with the face and part of the face is excluded while tracking the face

- **Principal Component Analysis Method**

PCA is an approach used for reducing the number of variables in face recognition.This approach transforms faces into a small set of essential characteristics, eigenfaces . These eigenvectors are obtained from covariance matrix of a training image set.
Recognition is done by projecting a new image in the eigenface subspace. The advantage of this approach over face recognition algorithms are in its simplicity, speed etc. The problem is limited to files that can be used to recognize the face. Namely, the images must be vertical frontal views of human faces.

- **Viola -Jones Algorithm**

Viola Jones is a framework for detecting faces. It has high detection rate .It gives a rate of 15 frames per second. The algorithm is implemented in OpenCV.

The algorithm has four stages:

1. Haar Feature Selection
2. Creating an Integral Image
3. Adaboost Training
4. Cascading Classifiers.

All human faces share some similar properties. These may be matched together using Haar Features. Viola Jones algorithm uses a 24*24 window. I

Integral image allows very fast feature calculation.It is used to represent images, and it can be evaluated using few operations per pixel.

A classifier is created for classifying the image using AdaBoost. AdaBoost

provides an effective learning algorithm and strong performance. It is also effiecient.

- **Kanade–Lucas–Tomasi (KLT)**

Itis an approach to feature extraction. It is mainly deals with the problem that traditional image registration techniques are costly. KLT makes use of spatial intensity information . It is faster than traditional techniques . KLT algorithms are beteer in performance.

The movement of the objects is tracked by using KLT algorithm. Set of object points is detected by this algorithm through the video frames. After completion of face detection the facial feature points is identified that is tracked. It tracks the point throughout the number of frames one by one referring the previous frame. After the face detection, it extract the facial expressions .Different approaches are adopted for several permanent facial features . It depends upon are the eyebrows, eyes, mouth, etc

KLT ALGORITHM	VIOLA-JONES ALGORITHM	PCA	CAMSHIFT ALGORITHM	LBP
• Faster in action • Better performance • Only tracking is done • Tracked the frames one by one	• Real time • Robust • detection is high. • only face detection no recognition • low false positive rate.	• Noise reduction • Treats the entire data set as a whole • performs unsupervised transformation • Lack of redundancy • Smaller database representation	• 2D probability distribution image is employed • used for tracking • less performance •	• Faster training time and object detection performance • simple computation and fast • shorter training time • robust • less accurate • high false positive rate