

# Multiple Face Detection and Tracking Using Skin Tone Segmentation Technique

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**ABSTRACT:** Skin feature segmentation has been widely employed in different aspects of computer vision applications including face detection and tracking systems. Due to the attractive characteristics of skin color and its effectiveness to object segmentation, recent years have witnessed renewed interest in developing skin segmentation approaches. There are certain problems are occurred in using human skin color as a feature to segment dynamic face features, such as various illumination conditions, complicated environment etc. To overcome these problems, skin tone segmentation algorithm and face feature (eyes, nose and mouth) extraction method are proposed for multiple face detection and tracking in input video. In this proposed work, segmentation of skin regions from a video frames is done by using RGB color model which help to detect the human face. Once the face is detected then they are tracked in video. The experimental results showed that the proposed scheme achieved good performance in terms of accuracy and computation time.

**Keywords**—Face detection, Face tracking, facial features extraction (eyes, nose, mouth), skin color segmentation

## I. INTRODUCTION

The human face is central to our identity. It plays an essential role in everyday interaction, communication and other routine activities. Face detection is the step stone to the entire facial analysis algorithms, including face alignment, relighting, modeling, recognition, and head pose tracking, face verification and authentication, facial expression tracking/recognition, gender/age recognition, and lots of more. The first and foremost important step in any of this system is the accurate detection of the presence human faces in an image or video and then this faces will track. The difficulty associated with face detection can be attributed to many variations in scale, location, orientation (in-plane rotation), pose (out of-plane rotation), facial expression, occlusions, and lighting conditions. Hence there is continuous

strife to propose effective face detection and tracking system with high accuracy and acceptable processing time. We present a novel approach for multiple face detection and tracking in input video using skin like homogeneous region which will be used to retrieve face area. This new approach speed up significantly the process of face detection and tracking while keeping the performance of the system and making possible to use the algorithm in every single frame of the sequence in a reasonable amount of time.

Face detection and tracking is an active area of research spanning disciplines such as image processing, pattern recognition and computer vision. Face detection and tracking are important in video content analysis since the most important objects in most video are human beings. Face detection and tracking is the process of determining whether or not a face is present in an image. The first step is skin segmentation, which is good enough to reject most of the data. After skin color segmentation facial features i.e. eyes, nose and mouth will be extracted for detection and tracking faces. Face detection and tracking is an extensively studied field and a large body of research has been done on these subjects. In this work, the MATLAB simulink platform is used for creating a system. Consequently, all the implemented algorithms are integrated with this system to process video frames sequentially one after another. All data processing, detection and tracking algorithms are handled within the simulation framework.

## II. LITERATURE REVIEW

In this section we present some earlier work for face detection and tracking using different algorithms. In the past, face detection and tracking have been implemented having distinct features that bring about the optimum area. Some of them have been described to give us an idea of earlier work and shed light on different optimization techniques. Past works review, gives us an idea about face detection and tracking. A widely used face detection method is the Histogram

Oriented Gradients (HOG) developed by Corvee, Etienne, & François Bremond. A multi view approach was here presented to detect frontal and profile pose of people face using Histogram of Oriented Gradients, i.e. HOG features. This technique detects frontal and profile pose of human faces quite successfully. A drawback of this algorithm is false detections in noisy environments.[2] [8] Jacob Foytika, Praveen Sankaranb, Vijayan Asaria proposed system for multiple face tracking and recognizing using Kalman filter and modular PCA. The proposed system utilizes the Kalman filter for tracking and they used a low level recognition system to properly distinguish between the many trackers. [4] M. Kim proposed a novel framework for enhancement of very low-light video. For noise reduction, motion adaptive temporal filtering based on the Kalman structured updating is presented. The proposed method exploits color filter array (CFA) raw data for achieving low memory consumption.[5] Manjunath Hire math, P. S. Hiremath proposed a novel method for the detection and tracking of a face in a video. The detection of the human face is achieved by using fuzzy geometric face model and face tracking is done by using a sparse representation based classification algorithm. [6] Tania Akter Setu & Dr. Md. Mijanur Rahman presented human faces detection within images and segmenting the face into numbered regions which are the face, mouth, eyes and nose regions respectively. For face detection, they used the Viola–Jones object detection framework.[7]

### III. SYSTEM MODEL DESCRIPTION

In this section, we introduce the implementations details. The below fig 1 shows the block diagram of multiple face detection and tracking using skin tone segmentation technique.

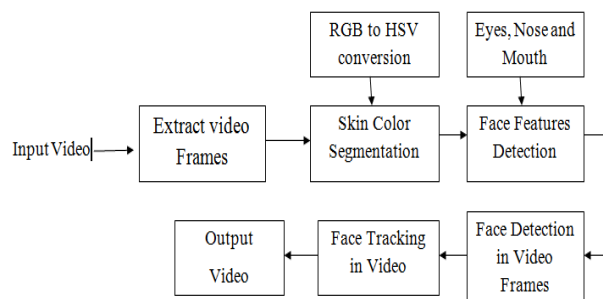


Fig 1: Block Diagram of Multiple Face Detection and Tracking in Video

The goal of face detection is to determine if there are any faces in the image or not and, if present, return the location and the bounding box of each face in the frames. By using skin color segmentation algorithm and face features extraction, multiple faces are detected and simultaneously they are track in input video. The steps for detection and tracking of multiple human faces in video has given as below.

1] Select input video: The video is an electronic medium for the recording, copying, playback, broadcasting and display of moving visual media. The video is made up by number of color frames or images. There are different types of video such as AVI, MP4, MPEG, MPG etc. We can select any type of video.

2] Video frames extraction: For segmenting the skin region in video, first important step is extracts the frames or images available in video. This extracted frames are color images i.e. RGB images

3] RGB to HSV conversion: For skin color segmentation, convert this RGB images into HSV images. Then extract the hue components from HSV color space. Classify the images in skin and nonskin pixels using the skin pixel range of RGB color space and HSV color space.

4] Skin color segmentation: Skin color is one of the most significant features of human face. Skin segmentation aims to remove all non-skin pixels in order to acquire good results in skin classification. In this thesis, a skin segmentation scheme based on RGB (Red, Green and Blue) pixels color is developed.

5] Face features extraction: The human face is among the most significant objects in an image or video. It is the feature which best distinguishes a person. It plays a key role in face detection and tracking systems and many other face analysis applications. We focus on the feature based approach because it gave great results on detect and track the human face. It locates faces by extracting structural features like eyes, nose, mouth etc. and then uses them to detect a face. To solve a problem of finding initial features of human face, it is needed to choose the facial features, which are more suitable for face detection. Three facial elements were chosen, which may be marked as features of face for detection and tracking the multiple face. They are eyes (left and right eyes), nose and mouth.

6] Face detection: Once these face features are detects in skin region, then there are faces are detects.

7] Once the faces are detect accurate using skin color segmentation algorithm then they will track in video using face features detection method.

#### IV. Experimental Results and Discussion

Experiments were performed to detect and track multiple human faces in video based on MATLAB simulink platform. For these purpose, we take different types of video as an input video. In this video, we detect and track human faces using skin color segmentation algorithm and face features extraction method. The percentage of correct detection is calculated as the ratio between the number of correct detection frames to the total number of frames. For this we have taken 10 different videos and performed experiments 60 times on one video and calculated the percentage of correct detection for each video. The results are shown in below table.

Table: Performance parameter values for different input videos

	Video 1	Video 2	Video 3	Video 4	Video 5	Video 6
CDR%	100	95	99.5	98	100	99
NDR%	5	15	10	5	5	5.4
FDR%	95	80	89.5	93	95	93.6
Error Rate	0	0.5	0.02	0.01	0	0

The graph of this result is shown in below.

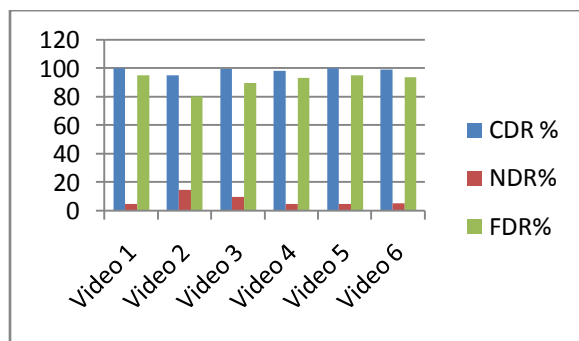


Fig 2: Performance parameter values for different input videos

#### V. Conclusion

In this work under consideration, a new Multiple Face Detection and Tracking system in video has proposed using skin tone segmentation algorithm and facial features extraction method. By utilizing beneficial features of skin tone segmentation algorithm using RGB color model has been implemented for detection of face. The facial features extraction method was used for detection and tracking of human face. On comparing with previous work, the project design found more accuracy for multiple human face detection and tracking in input video. As security is an important factor in computer vision system, a lot of work can be done in future to achieve more security with better detection and tracking of multiple human faces in real time video. In many areas like military, airport, banks etc security is very essential. Based on this viewpoint, this system will be carried on in future to further improve the algorithm performance.

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