Scientific Journal Impact Factor (SJIF) : 1.711
International Journal of Modern Trends in Engineering and Research
ISSN (ONLINE) : 2349 - 9745
ISSN (PRINT) : 2393 - 8161

HEAD DETECTION AND TRACKING SYSTEM

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Abstract - HDTS (Head detection and Tracking System) detects and tracks multiple people in a real time video stream in an efficient way. HDTS detects heads and faces in an outdoor and indoor environment and keeps track of them.
HDTS uses Partial Head Contour method to detect head and Feature invariant methods to detect face. Head is located at an extreme position of the body and there is noticeable difference between the head and the shoulders in the input image. Face can be detected by finding the distance between eyes, colour intensity between eyes and other parts of the faces.
HDTS is able to re-detect a person even if he/she is invisible for some time. People can become invisible if they wall behind pillars or walls. The principle in developing this system can be extended to solve other problems such as human gesture recognition and face recognition.
Keywords: Face detection, Head detection, tracking.

I. INTRODUCTION

Face detection is a computer technology that identifies human faces in digital images. It detects human faces which might then be used for recognizing a particular face. This technology is being used in a variety of applications nowadays. Face detection is used in biometrics, often as a part of a facial recognition system. It is also used in video surveillance, human computer interface and image database management. It is widely acknowledged that the face recognition have played an important role in surveillance system as it doesn't need the object's cooperation.. The tracking adopted by HDTS continues even if there are various degrees of occlusion in the corresponding frames. Fig.1 represents the block diagram of entire HDTS system. It shows that HDTS takes a video stream as an input and it sends that video as arguments to two modules: detect face and detect

head. In detect face the face present in the video will be detected. Similarly in detect head, heads will be detected. After detecting faces and heads those two will be merged in such a way that no overlap of faces and head happens and this will be tracked. Finally the video with detected faces and heads will be played.

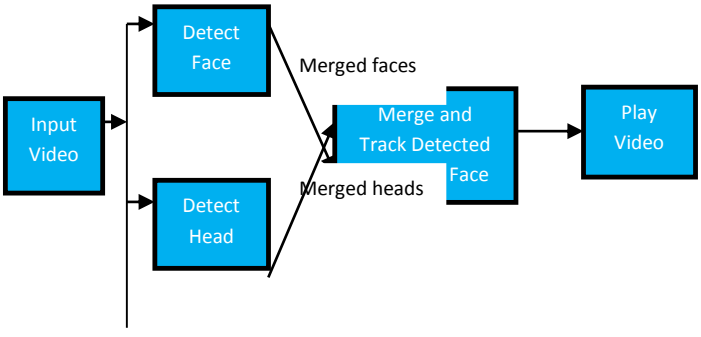

Fig.1

II. EXISTING SOLUTIONS

In this section we describe about the existing solutions to two major problems in HDTS system: Head detection and Face detection.

2.1 Head Detection

Detecting a human head is important in many applications in everyday life such as occluded face detection and recognition, human tracking and diagnostic in medical system. In the present, video surveillance system is widely used and records data
into 2D image. However, most of current methods
perform effectively when facial region is available. Therefore, it is important to use an algorithm which is pose invariant and is capable of detecting heads efficiently in various degrees of occlusion. HDTS aims to detect human head from any viewpoint of head from a video sequence. Shape contour matching algorithm [9] for Head detection is applied to the input image frame to detect and locate head shape objects based on a probabilistic framework. In the process of head shape detection, upper half circle is used as head shape template for locating the potential head candidates in image. Later researchers showed that detected head, based on the assumption that human head and body contours, have an omega shape. Three features which are gray, skin colour and edge is used to define human region and then Ellipse fitting technique [11] is used to determine position of head.

2.2 Face Detection

Face detection must deal with several well-known challenges. They are usually present in images captured in uncontrolled environments, such as surveillance video systems where lot of variations in position of person, lighting conditions, movement of camera occurs. There are many techniques to detect a face in a scene-easier and harder ones. Here is a list of the most common approaches in face detection:

Finding faces by colour:

Using typical skin colours to find face segments. The disadvantage is it doesn't work with all kind of skin colour and is not very robust under varying lighting conditions.

Facial expression:

People can have different facial expression like laughing, crying, angry face, closed eyes etc. Facial features also vary greatly because of different facial gestures.

III. PROPOSED SOLUTION

3.1 Head Detection

To overcome the limitations, HDTS uses Blob analysis method to detect head. HDTS assumes that the head which needs to be detected is a bear head without any occlusions i.e., person should not be wearing any hats or any other objects that cover the head region and the person is in an upright position. In this method first HDTS acquires the image from the video then uses background subtraction [10] method to remove the background. Then it performs blob analysis based on the shape of the head to determine the possible position of the head region. Fig. 2 below shows the flow diagram for head detection.

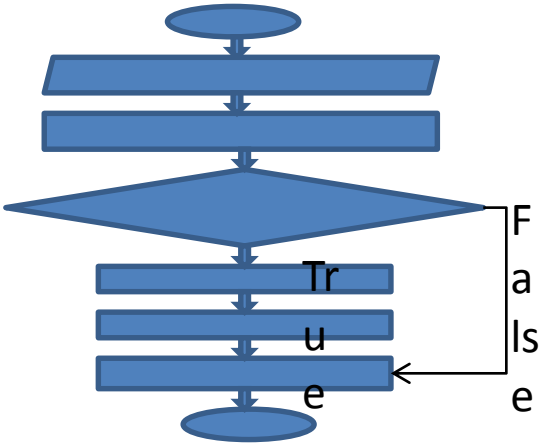

Fig.2

3.2 Face Detection

In HDTS we use Viola Jones algorithm to detect the face. The basic principle of the Viola-Jones algorithm is to scan a sub-window capable of detecting faces across a given input image. The standard image processing approach would be to rescale the input image to different sizes and then run the fixed size detector through these images. This approach turns out to be rather time consuming due to the calculation of the different size images. Contrary to the standard approach Viola-Jones rescale the detector instead of the input image and run the detector many times through the image – each time with a different size. Fig. 3 shows the flow diagram for face detection.

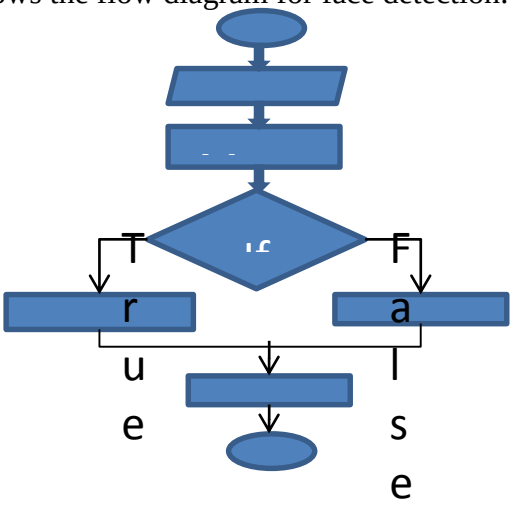

fig3

IV. APPLICATIONS

It is commonly used in applications such as security, surveillance, and against terrorist activities. It can be also used to estimate the queue length in retail outlets. Home security systems are another field where this can be applied. In colleges, this can be used to track the attendance of students and lecturers. In offices, this can be used for automated controlling of lights and fans on the presence of people in a room.

V.CONCLUSIONS AND FUTURE WORK

HDTS in future can be enhanced to detect person even without a bear head i.e., it can detect and track a person even if he is wearing a hat. HDTS in future can also be used as basis for other systems such as facial recognition system. Here HDTS had detected faces of people so in future it would be enough to just apply a facial recognition algorithm to this. So using this added feature of facial recognition to

HDTS, in addition to tracking people we can also get details of those people. Another improvement could be recognizing the gestures performed by the people. While tracking people we can apply a gesture recognition algorithm to know what people are doing. And based on what they are doing we can take some actions if necessary and also its accuracy can be improvised for dynamic background videos. This can be done by applying some dynamic background modelling and subtraction algorithms like retrieval of threshold signals, local dependency histogram, and covariance based methods and fuzzy background subtraction method.

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