A HYBRID FACE DETECTION SYSTEM USING COMBINATION OF APPEARANCE-BASED AND FEATURE-BASED METHODS

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Abstract: Human face detection is preliminary required step of face recognition systems as well as a very important task in many applications, such as security access control systems, video surveillance, and human computer interface and image database management. This project intends to combine Viola and Jones face detection method with a color-based method to propose an improved face detection method. Experimental results show that our method efficiently decreased false positive rate and subsequently increased accuracy of the face detection system especially in complex background images. Also our proposed method considerably increased face detection speed. The common goal is classification with least amount of error.

II. PROBLEM DEFINITION

Face detection and tracking has been the topics of an extensive research for the several past decades. The development of robust face detection systems is quite essential in a variety of applications such as robotics, security systems, intelligent human-computer interfaces, etc. A number of face detection algorithms such as those using Eigen-faces and neural networks, for instance, have been developed. In these algorithms, however, a large amount of numerical computation is required, making the processing extremely time-consuming. There are various algorithms including skin color based algorithms for detecting faces within an image. Color is an important feature of human faces. Using skin-color as a feature for tracking a face can help to increase detection rate because color processing is usually much faster than processing other facial features. However, color-based face detection algorithms have several problems like the color representation of a face obtained by a camera is influenced by many factors (ambient light, object movement, etc.), different cameras produce significantly different color values even for the same person under the same lighting conditions and skin color differs from person to person. In color-based face detection systems we are usually facing to three main problems, that is, what color-space is better to choose, how exactly the skin color distribution should be modeled, and finally, what will be the way of processing of color segmentation results for face detection. This synopsis describes a project of a face detector realized in MATLAB, based on face detection appearance based method with a feature based method to propose an improved face detection method.
III. PROPOSED WORK
1. Viola and Jones based face detection:
The Viola–Jones face 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. This algorithm is implemented in OpenCV as cv.Haar Detect Objects(). Viola Jones face object detector become famous due to its open source implementation in the OpenCV library. In order to find and trying to match from an object of an unknown size is usually adopted to work this field that possesses a high efficiency and accuracy to locate the face region in an image. The Viola - Jones method for face object detection contains three techniques:
1. Integral image for feature extraction the Haar-like features is rectangular type that is obtained by integral image
2. Ad a boost is a machine-learning method for face detection, The word —boosted means that the classifiers at every stage of the cascade are complex themselves and they are built out of basic classifiers using one of four boosting techniques (weighted voting).
3. Cascade classifier used to combine many features efficiently. The word —cascade in the classifier name means that the resultant classifier consists of several. Simpler classifiers (stages) that are applied subsequently to a region of interest until at some stage the candidate is rejected or all the stages are passed. Finally, the model can obtain the non-face region and face region after cascading each of strong classifiers

1.1 Viola Jones Upper body objects detection:
Accurate upper body object detection improves the robustness of face and reduces the challenging task of object detecting upper bodies from unconstrained still images and video. The cascade object detector uses the Viola-Jones face detection algorithm to detect people’s upper body and face object detection. The model detects the upper-body region, which is defined as the head and shoulders area as well as reorganization of upper body and face object. This model uses Haar features and object detection to encode the details of the head and shoulder region. Because it uses more features around the head and face object, this model is more robust against pose/image changes, e.g. head rotations/eye blinking tilts To Detect Upper Body in an Image Using the Upper Body Classification Model.

1.2 Viola-Jones Face objects Detection Algorithm:
Early efforts in face object detection have dated back as early as the beginning of the 1970s, where simple heuristic and anthropometric techniques. Face detection techniques can be categorized into two major groups that are feature based approaches and image based approaches. Image and video based approaches use linear subspace method, neural networks and statistical approaches for face object detection.
Face feature based approaches can be subdivided into low level and high level analysis, feature analysis and active shape model analysis. Face detection is controlled by special trained scanning window classifiers Viola-Jones Face Detection Algorithm is the first real-time face detection system.

1.3 Viola-Jones Eye Detection Algorithm:
Eyes are detected based on the hypothesis that they are darker than other part of the face, finding eye analogue segments searching small patches in the input image that are roughly as large as an eye and are darker than their neighborhoods. a pair of potential eye regions is considered as eyes if it satisfies some constraints based on anthropological characteristics of human eyes. To discard regions corresponding to eyebrows, the model uses the fact that the center part of an eye region is darker than other parts. Then a simple histogram analysis of the region is done for selecting eye regions since an eye region should exhibit two peaks while an eyebrow region shows only one. A final constraint is the alignment of the two major axis, so the two eye regions belong to the same line. The study propose a new algorithm for eyes detection that uses Iris geometrical information for determining the whole image region containing an eye, and then applying the symmetry for selecting both eyes.

2. Flowchart for Viola-Jones Method:
IV. RESULT

Figure 4.1: load image

Figure 4.2: select image

Figure 4.3: display image

Figure 4.4: select viola-johns method
Figure 4.5: apply viola-johns method

Figure 4.6: skin colour method

Figure 4.7: apply skin colour method

Figure 4.8: gray scale image

Figure 4.9: hybrid face detection method

Figure 4.10: apply hybrid face detection method
V. CONCLUSION
In this paper we briefly described Viola and Jones face detector. Skin color classification has also been discussed and the combination of these two methods is proposed as a hybrid face detection system. The results show that our proposed method efficiently increases face detection speed as well as decreases false positive rate. For the future work, in order to increase efficiency of our method other color spaces and methods for skin color classification will be studied and examined.

VI. REFERENCES