

PROFILE FACE DETECTION EMPLOYING SKIN COLOR AND SIMPLE RECTANGULAR FEATURES

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Abstract:

Detection and localization of human face/s in large images is an important first step for further steps in image processing like face tracking, pose estimation and face recognition etc. Efficient methods for face detection are of much importance. One seminal paper on face detection is “Rapid object detection using a boosted cascade of simple features” by P Viola and M Jones . This paper contributes to the area of face detection by presenting three new ideas. It proposes a set of ‘simple rectangular features’ which can be calculated very rapidly thus reducing the overall face detection time. Secondly, a learning algorithm based on adaboost is proposed which assures high detection rates. Thirdly, a method of combining classifiers in an object-specific focus-of-attention mechanism is presented. The technique quickly discards non-face areas in an image in initial stages. Further processing is restricted to probable-face areas. Each stage of classifiers discards some more areas as non-face and final stages of classifier work only on relatively small image areas. The overall scheme has demonstrated high detection rates at very high speed. The technique only employs rectangular features which are infact gray-level differences between rectangular image areas. Abovementioned methods, however, detects only frontal upright faces. Though some level of variation in pose is accommodated, complete profile faces (45 and 90 degree profiles) are not detected. We propose two promising enhancements in the viola/Jones technique. First, we add the capability of profile face detection to the existing method. We suggest a mechanism by which the classifier cascade focuses on both profile and frontal upright faces. This is achieved while maintaining the object-specific focus-of-attention functionality which so quickly discards non-face areas in the image. Hence a very useful capability is added without compromising detection speeds. Skin color of human face / body is a feature which can be used to detect human presence in colored images. There are many techniques which employ skin color as a face detection feature. The second contribution of our paper is the bringing together of the two techniques i.e., use of skin color as a face detection feature, in conjunction with rectangular features (with adaboost) technique. Our classifier will be trained on a face database containing frontal, profile and non-face images. Our innovative approach can be used to detect both frontal and profile faces in colored images, while achieving very high speed results. The method also considers the fact that some faces may have non-conventional skin colors, for example clown-like painted faces. The fact that skin colors of people vary a great deal is another challenge. A very high detection rate can be achieved when continuous video frames are being processed for face presence.