VIDEO SURVEILLANCE USING FACIAL FEATURES-BASED TRACKING

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ABSTRACT. *In this work, we present a real time system for facial features detection and tracking in image sequences. We are interested in developing a human tracking system that can improve human-computer interaction and benefit video surveillance problems by making it invariant to rotation, illumination and subject's movement. However, since human body and face movements are very complicated to detect and track, all available cues that can narrow the search space should be considered. This paper describes a novel strategy for both face tracking and facial feature detection. Face detection is important because it reduces the search space and consequently saves time for further face processing, e.g., recognition or transmission. Moreover, facial feature detection enables face normalization which leads to size invariant face recognition. The proposed face tracker resembles human perception in that, initially, it utilizes motion as the major cue and thereafter, searches for the eyes in the areas likely to contain human faces. The presence of a face is determined using an eye tracker. Eyes are important facial features due to their relatively constant interocular distance. In this work, efficiency improvement focuses on two points: reducing template matching area and speeding up the matching process. Our method initially detects two rough eye candidate regions using a feature based method. All other processes are thereafter performed inside the candidate regions. In addition, we can evaluate the size of eye template according to the size of the regions. Altogether, the proposed method combines the accuracy of template based methods and the efficiency of feature based methods in the visual spectrum. To prove the effectiveness of this approach, we performed comparative experiments using real video images. We achieved a real time detection accuracy of about 96%.*
Keywords: Skin detection, Face tracking, Template matching, Eye detection

1. **Introduction.** Machine detection and tracking of human faces from video frames is emerging as an active research area spanning several disciplines such as image processing, pattern recognition and computer vision. Numerous attempts have been conducted in face localization and identification for a variety of applications including intelligent surveillance, law enforcement systems, virtual reality interfaces, etc. The main focus is on the extraction of primary facial features such as eyes, eyebrows and nose and mouth. Facial features are very important for many applications like face expression recognition, rotation invariant face recognition and person's state monitoring.

However, face detection provides interesting challenges due to the stringent requirements for pattern classification and learning techniques. The dimension of the feature space is extremely large. Therefore, training and testing face classifiers is computationally expensive. Moreover, the other factors that affect the system's performance include scale, pose, illumination, facial expression, occlusion and age. The human body, especially