A Study of Facial Image Locating

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ABSTRACT

Face detection is the foundations of some applications including machine vision, face tracking and face recognition. It has been broadly applied in the areas such as human machine interface, video surveillance, public security, access surveillance, medical diagnosis, and intelligent life. Hence, face detection is very crucial to our future life, indicating that it should highly achieve both the accuracy and performance. In this study, we propose a novel algorithm with two stages to detect the potential face regions in the images. A cascade Adaboost with Haar-like features is used as the first stage to exhaustively search for the potential face regions in the image, followed by a second stage, SVM (support vector machine) with LBP (local binary pattern) features being applied to filter out the non-face regions mistreated as face regions by Adaboost in the first stage. CMU face database with four file directories, labeled as newtest, test, test-low, and rotated, is popular to be used in the performance testing for a new face detector. The detection rates of the proposed detector for newtest, test, test-low, and rotated are 86.1%, 79.0%, 45.8%, and 38.9%, respectively, when Adaboost with Haar-like features is utilized. Furthermore, with SVM and LBP features used as the second stage, the detection rates slightly decrease to 91.0%, 69.2%, 81.7%, and 79.1%, respectively, for the testing directories mentioned above. The experimental results also show that even though the quality of the testing images is not good, Adaboost with Haar-like features can still retain the most information of face features. But when the types of Haar-like features used are not enough, the false alarm rate (i.e., classifying non-face regions as face regions) is still high for this method. However, when SVM with LBP features used as the second stage, it can effectively eliminate the potential face regions mistreated in the first stage. The LBP features, however, cannot hold the most information of face features if the textures of face images are not complete. As the experimental results revealed, most of the face regions undetected are due to tilted images or those with large rotation angles (in-plane or out-of-plane). Additionally, the face regions misclassified are primarily caused by those images with distinct horizontal or vertical features, or with partially occluded faces. To reduce the false alarm rate, the possible ways in our future work can increase some rotated Haar-like features, or increase more versatile examples with glass-wearing, hat-wearing or partially occluded faces in the training stage.

Keywords : face detection ; SVM ; AdaBoost ; LBP

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