Abstract

Face detection is a very challenging and interesting problem. In this paper, a new scheme for detection of multiple faces using Haar wavelet packet decomposition based on quantized skin color region merging under unconstrained scene conditions is presented. Color clustering and filtering using approximations of the YCbCr and HSV skin color subspaces are applied on the original image by providing quantized skin color regions. A merging stage is then iteratively
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performed on the set of homogeneous skin color regions in the color quantized image, to provide a set of potential face areas. Face intensity texture is analyzed by performing wavelet packet decomposition on each face candidate in order to detect human faces. The wavelet coefficients of the band filtered images characterize the face texture and a set of simple statistical deviations is extracted in order to form compact and meaningful feature vectors. Then, an efficient and reliable probabilistic metric derived from the Bhattacharyya distance is used to classify the extracted feature vectors into face or nonface areas, using some prototype face area vectors, acquired in a previous training stage. The proposed system leading to a successful detection rate of 99% for single face, animal and nonfaced images. If the image consists of multiple faces, more complex background and extreme lighting conditions, the efficiency is reduced to 85% due to false acceptance and false rejection especially in scene with much partially occluded face or under extreme lighting conditions or with pose. If faces are oriented more than 15° our system fails to detect such faces.

Reference

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Index Terms

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Key words

Face Detection

Wavelet Packet Decomposition

Bhattacharya Distance