

Face detection method using HOG features

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Abstract: This thesis presents a novel method for human face detection utilizing Histogram of Oriented Gradients (HOG) features. While HOG descriptors have been widely employed for general object detection, their application to face detection presents unique challenges due to the high variability in facial appearance, pose, and lighting. The proposed approach addresses these limitations by optimizing the HOG feature extraction pipeline specifically for facial characteristics. A comprehensive analysis of cell size, block normalization, and gradient orientation binning is conducted to maximize discriminative power. The extracted features are then classified using a Support Vector Machine (SVM) trained on a large, diverse dataset of facial and non-facial images. Experimental results demonstrate that the optimized HOG-based detector achieves a high detection rate with a low false positive rate, outperforming traditional Haar-like feature cascades in terms of robustness to partial occlusion and illumination changes. The method offers a computationally efficient solution suitable for real-time applications, providing a strong balance between accuracy and processing speed for automated face detection systems.

Keywords: HOG, face detection, feature extraction, object detection