

PEDESTRIAN DETECTION BASED ON HYBRID FEATURES USING NEAR INFRARED IMAGES

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ABSTRACT. *This paper explores a hybrid-based method to fuse multi-slit features and Histograms of Oriented Gradients (HOG) features for pedestrian detection from Near Infrared (NIR) images. The fused feature set utilizes both the multi-slit method's capability of accurately capturing the local spatial layout of body parts (head, torso and legs) in individual frames and the HOG's capability in region information relevant to higher frequency components. The hybrid feature vector describing various types of poses is then constructed and used for detecting the pedestrians. The part based pattern matching analysis indicates that the fused features have much higher feature space separation than the pure features. Experiments with a database of NIR images show that the proposed method achieves a substantial improvement in tackling some difficult cases such as side view, back view which the conventional HOG method cannot handle. Detection and recognition performance is less computationally expensive than existing approaches.*

Keywords: Hybrid feature, Pedestrian detection, Multislit-HOG, Vanishing line, NIR image

1. Introduction. Pedestrian detection has received considerable attentions in recent years. A robust solution to this problem would have numerous applications, such as automated visual surveillance, content-based image retrieval and vehicle driver assistance systems. Moreover, the heavy investments made by almost all car manufacturers on this kind of research prove that particular attention is now focused on improving road safety, especially for reducing the high number of pedestrians being injured every year [1,2]. However, detection of pedestrians in images is still a challenging task because of following reasons: (a) various changes in appearance of pedestrians due to different poses, clothing, viewpoints, illumination and articulation, which are known as large intra-class variability, (b) common likeness between pedestrians and other background objects in heavy cluttered environment, which can be seen as inter-class similarities and (c) partial occlusions (may be change frequently in a dynamic scene) of pedestrians by other inter-class or intra-class objects.

Figure 1 shows some pedestrian samples in real environment that vary in pose, color, texture, illumination, occlusion, view point and background. Considering the difficulties mentioned above in pedestrian detection tasks, the most commonly used tactics is to train one or more classifiers based on many labeled samples of pedestrian and non-pedestrian, and then use the classifiers to detect the unknown images. In this paper, inspired by our previous related work, we employ a hybrid-based method to fuse multi-slit features and Histograms of Oriented Gradients (HOG) features for pedestrian detection from Near Infrared (NIR) images. A body part feature extraction concept is used twice, first to