Methods and Experiments of Pedestrian Detection

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Introduction
The topic of this RISS project is pedestrian detection in images. There are many machine vision approaches for detecting pedestrians. We want to use OpenCV tools to implement, train, and evaluate detectors using Haar and Hog features[1].

Challenges
- Wide variety of articulated poses
- Variable appearance/clothing
- Complex backgrounds
- Unconstrained illumination
- Occlusions, different scales

Database

<table>
<thead>
<tr>
<th>Database Name</th>
<th>INRIA</th>
<th>CVC02</th>
<th>CVC07</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive samples</td>
<td>3506</td>
<td>2054</td>
<td>4824</td>
</tr>
<tr>
<td>Negative samples</td>
<td>From internet(29552)</td>
<td>From internet(29552)</td>
<td>From internet(29552)</td>
</tr>
</tbody>
</table>

Methods
1. Collect enough samples to train classifiers.
2. Input classifier to the detection program and analyze images.
3. Compare detection results with groundtruth, evaluate experiments using miss rate and false positive per image.

① HAAR-like Feature
HAAR-like Feature are the difference of the sum of pixels of areas inside the rectangle, which can be at any position and scale within the original image.

② HOG Feature
HOG feature means local object appearance and shape within an image can be described by the distribution of intensity gradients or edge directions[2].

Experiments
HAAR+Adaboost
We tested the dependency of the classifiers on the number of training samples and the number of stages. We did four experiments and got their results. And we used miss rate and false positive per image to express the detection results. We also compared our results with the results in the paper[1]. In the paper, they evaluated different methods to detect pedestrians. The average analysis time per image is 300ms.

HOG+Adaboost
Use pre-trained classifier called hogcascade _pedestrians.xml in OpenCV

Detection Results Curves
The curves in the left graph show results of our five experiments, the curves in the right graph show the comparison of our best result and the results in the paper[1]. The results in the paper are better than our experimental results, we also need to consider some other effects, such as the difference of test samples.

Conclusion
After study, we got some results in computer vision and pedestrian detection. During this process, we did lots of experiments and trained couple of classifiers. More samples, better results. Actually, the accuracy of experiments still has enough space for further improvement.

References