Cascade Classifier Training for the Problem of Video-Based Pedestrian Object Detection

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Research relevance

A need for object recognition and detection increases

Most of proposed automatic video analysis methods does not provide required detection quality
Goal and tasks

Development of real-time pedestrian detection application based on Viola and Jones’ method

- Method implementation via an experimental sample of the program
- Application testing under real road conditions
- Analysis of the results
Viola-Jones method

- Use of simple functions:
  - Haar features
  - Local binary patterns

- Integral image representation on the basis of these features

- Building of a classifier based on the adaptive boosting algorithm AdaBoost

- Classifiers combining into the cascade structure to superpose multiple functions
Program implementation

Positive samples preparation:
- avoiding the use of ready-made image databases
- one-to-one correspondence between object proportions and image size

Negative samples preparation:
- getting environment images via automobile video recorder
- use of positive samples pieces without objects as negative ones

Classifiers training:
- experimental selection of learning parameters

Use of generated cascades:
- application development to process both of cascade types
Experimental testing

1. Laptop **fixation** in a car
2. Application **launch** when approaching a pedestrian crossing
3. **Recording** of application performance on the display
4. Experiment **start**:
   - one object detection
   - group of objects detection
5. Video **splitting** into frames after completion of the experiments
6. Images **analysis**
Results of the experiments (1)

Haar features:
- False negatives rate: 13%
- False positives rate: 3%

LBP:
- False negatives rate: 32%
- False positives rate: 4.5%
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<thead>
<tr>
<th></th>
<th>Haar features</th>
<th>LBP</th>
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<tbody>
<tr>
<td>Average number of skipped objects per second</td>
<td>2,14</td>
<td>6,57</td>
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Conclusion

The most popular object detection methods are analyzed:
- based on Haar features
- based on local binary patterns

The methods are implemented via an experimental sample of the program

Research of the application performance is conducted and following conclusions are drawn:
- classifier trained via Haar features gives satisfactory results for the problem of real-time pedestrian detection
- LBP-trained classifier does not provide required
Thank you for your attention!