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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

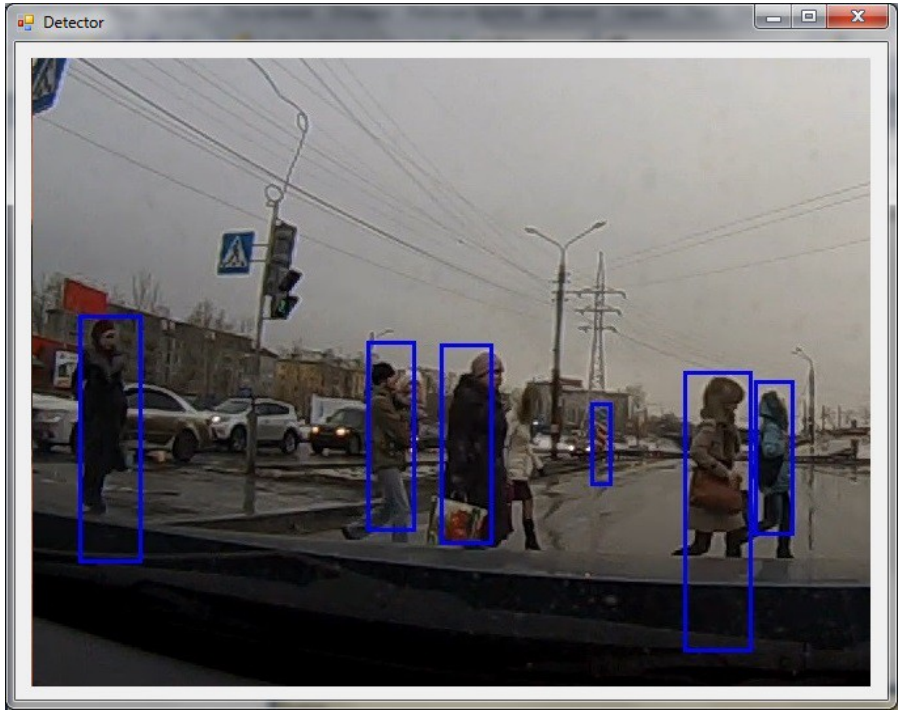
- Use of generated cascades:
  - application development to process both of cascade types

Experimental testing

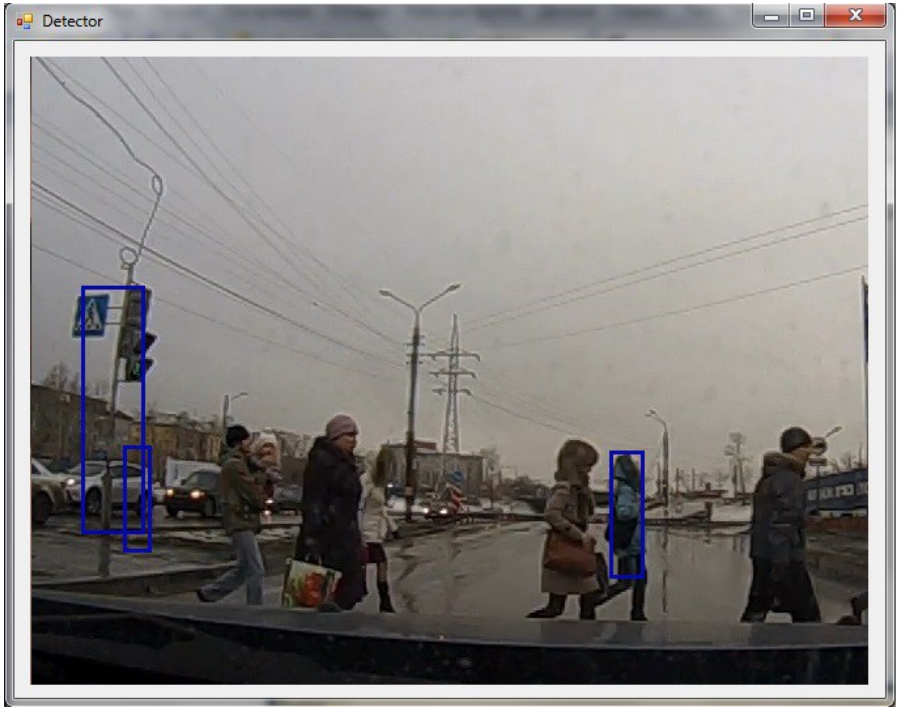
1. Laptop fixation in a car
2. Application launch when approaching a pedestrian crossing
3. Recording of application performance on the display
4. Experiment start:
   - one object detection
   - group of objects detection
5. Video splitting into frames after completion of the experiments
6. Images analysis

Results of the experiments (1)

Haar features

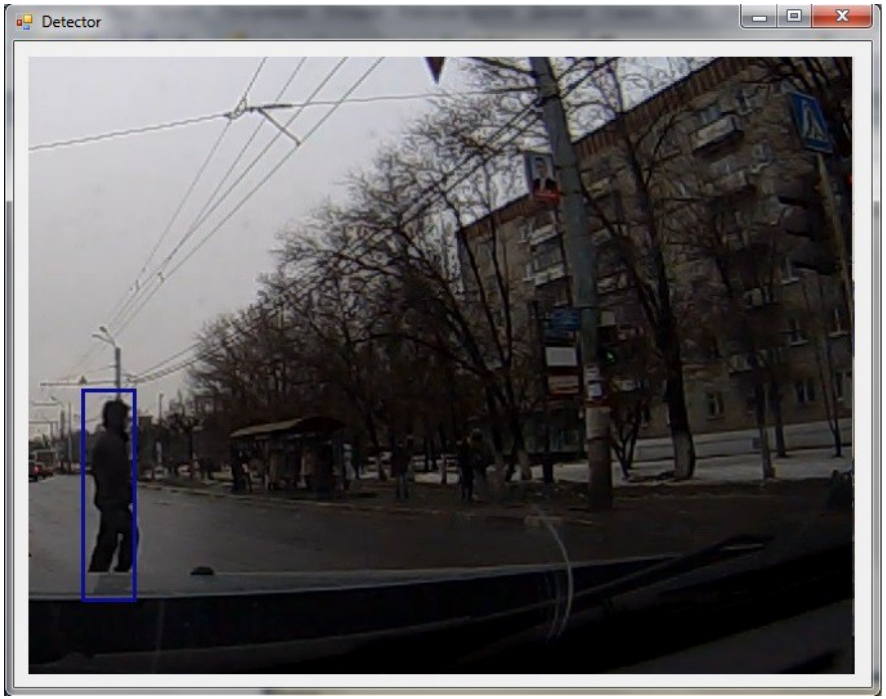
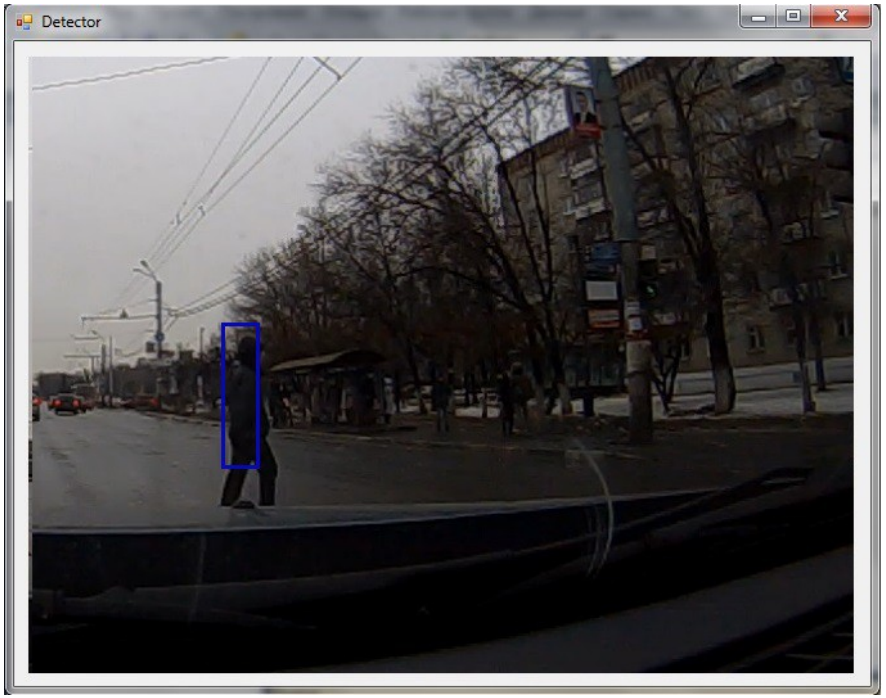


LBP



13%	False negatives rate	**32%**
3%	False positives rate	**4,5%**

Results of the experiments (2)

Haar features		LBP
		
2,14	Average number of skipped objects per second	**6,57**

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!