ECE 407 Project

Multi-Object Detection

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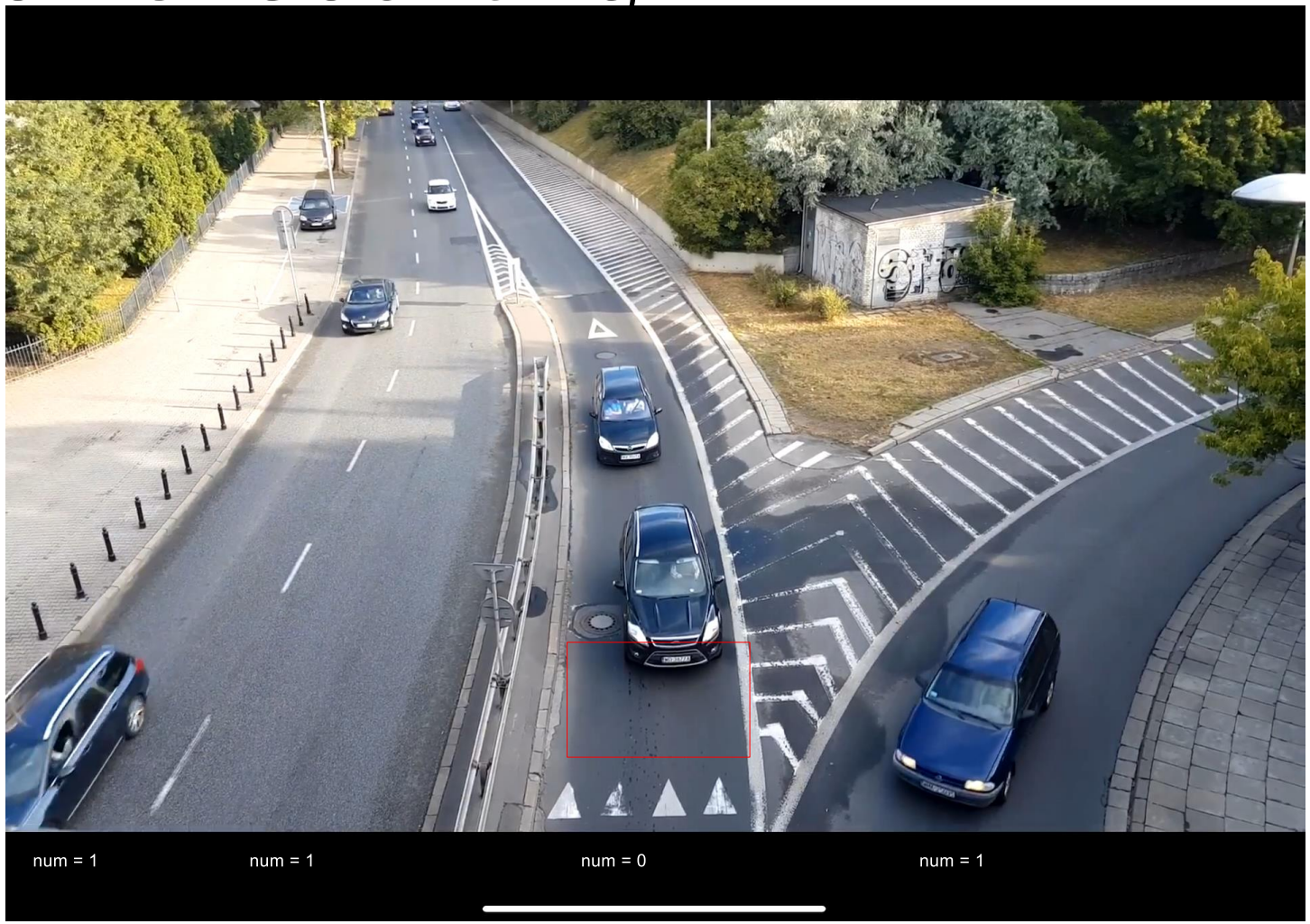
Tianda Liu

What we did

- Multiple Objects Detection
  - Detection
  - Counting
  - Tracking
  - Prediction
  - Application

Detection & Counting



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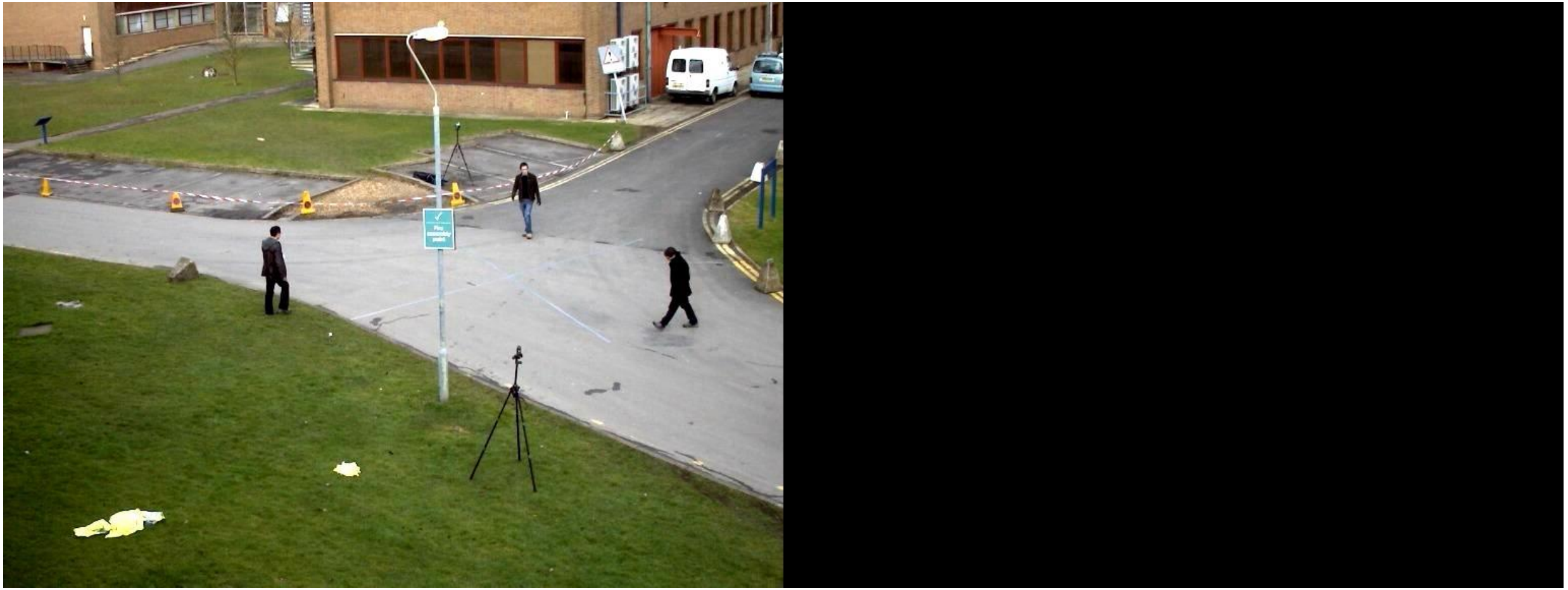
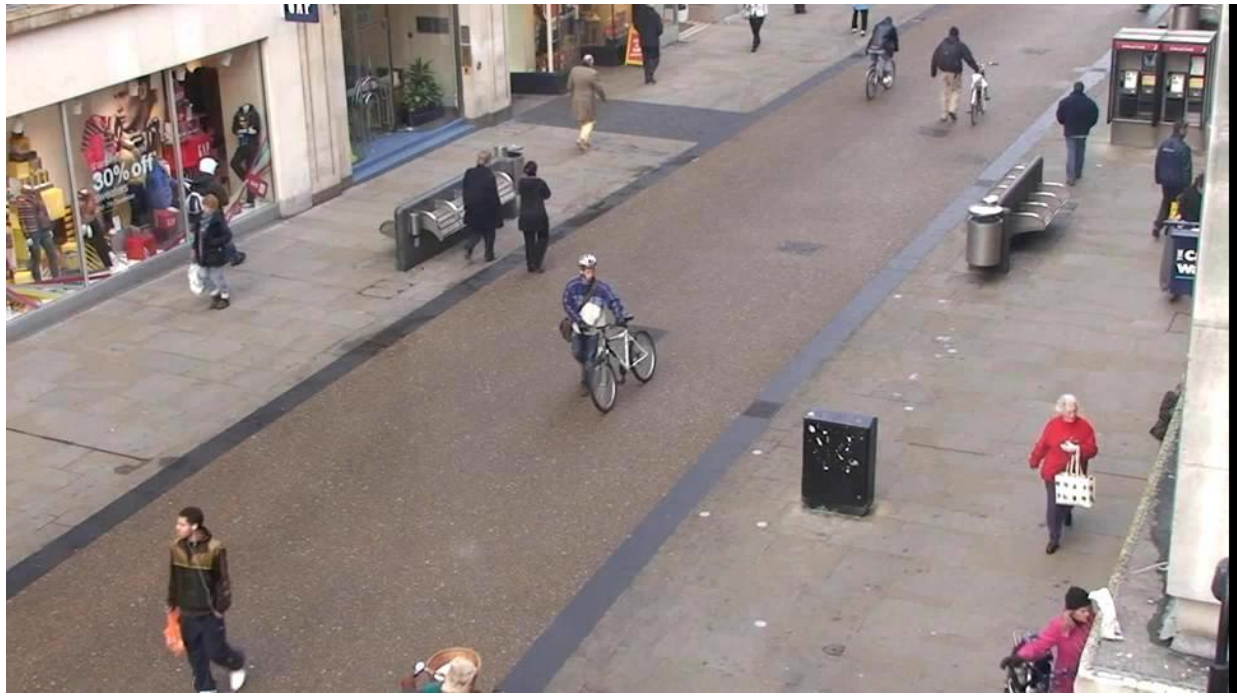
Tracking & Prediction



Vedio From MOT Change

Tracking & Prediction



Vedio From MOT Change

Motivation

- Statistics of the motor and non-motor vehicles
- Solving the problems of the Imbalanced time control of the traffic light
- Dynamic control the vehicle flow
- Increasing the utilization of traffic resources
- Making the prediction

Process

- Original work
  - Background subtraction algorithm
  - Processing of the foreground
  - Segmentation of the traffic lane
  - Choosing the method of detection
  - Optimization
  - Tracking
  - Prediction
  - Debug & Test

Work Arrangement

- Jiapeng Li
  - Background subtraction algorithm
  - Segmentation of the traffic lane
  - Testing the method of detection
  - Optimization
  - Debug & Test--Video1
  - Improvement (Tracking, Prediction)
- Tianda Liu
  - Processing of the foreground
  - Testing the Result of different method
  - Optimization
  - Debug & Test--Video2
  - Improvement (Tracking, Prediction)

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Background subtraction algorithm

- Two keys:

➢ Background subtraction algorithm based on Gaussian mixture models

➢ Choose the image without cars as the background

Background subtraction algorithm

- Background difference method

➢ Choose a picture without a car as the background

➢ Use the mean filtering method, the W4 method or some background statistical algorithms.

⇩

The background

Extraction foreground

- Subtract the another image from the background.

➢ Choose a picture without a car as the background

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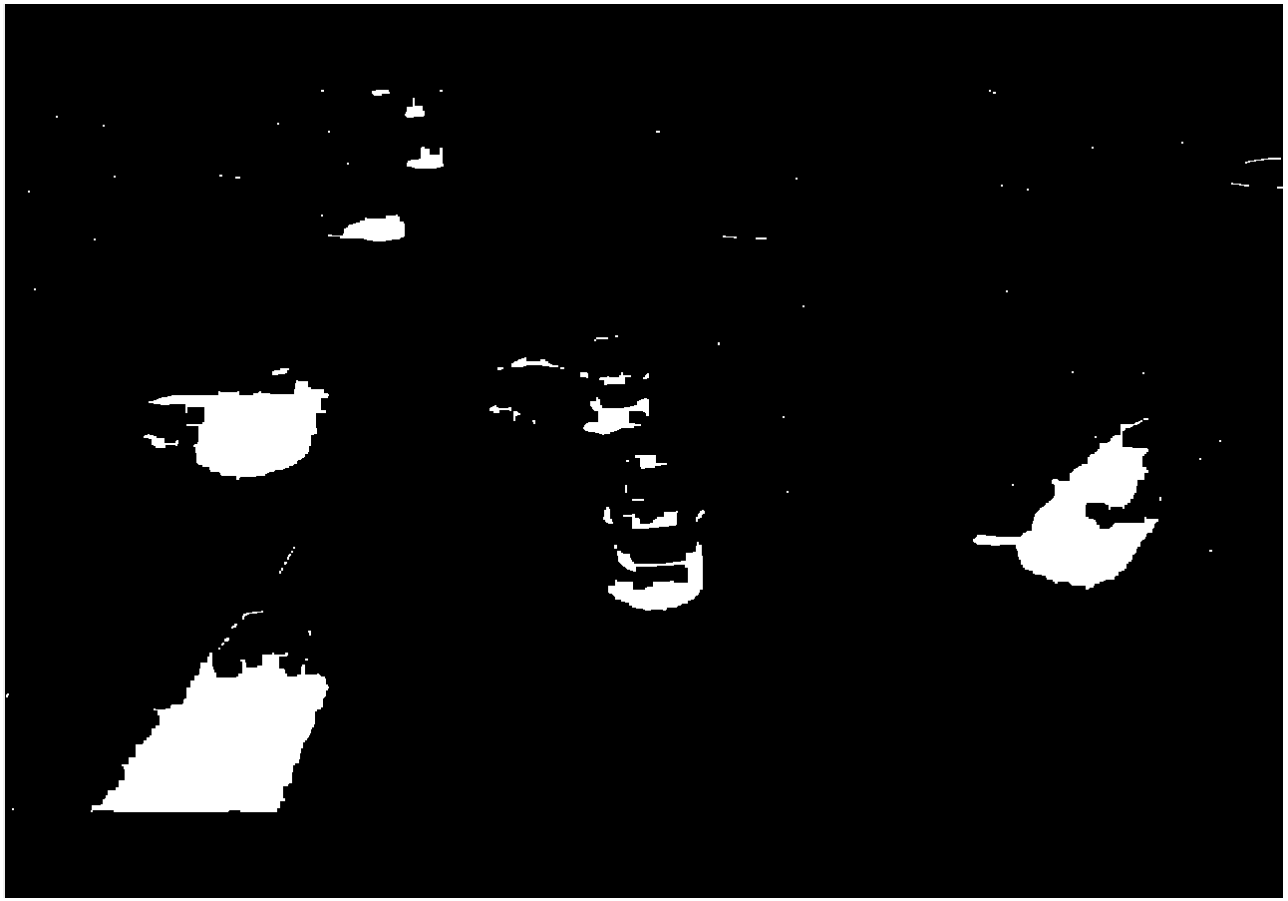
Processing of the foreground

- Video has too much noise

➢ If we use difference between two original images, there will be a lot of pixel changes that are not caused by the car.

Processing of the foreground

- Video has too much noise



Processing of the foreground

- Solution

➢We use difference between binarized image to calculate the change of objects.

➢We use erosion to eliminate some small pixels impact.

➢We use dilation to characterize the shape of objects.

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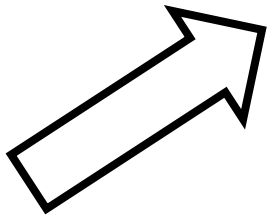
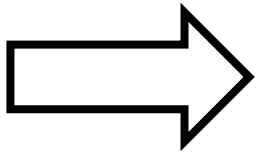
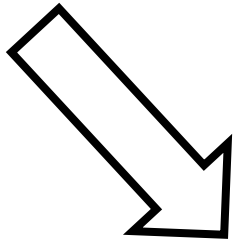
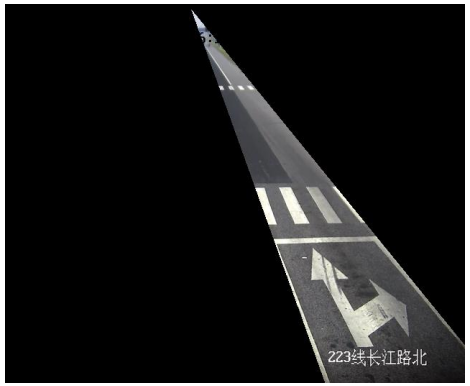
Segmentation of the traffic lane

- Cut the image into several lanes









Segmentation of the traffic lane

- Choose 6 points in each line.
- Choose 2 points randomly in one line, and calculate the linear equation based on the coordinates of the two points.
- The parameters of the equation are averaged to obtain the final linear equation.

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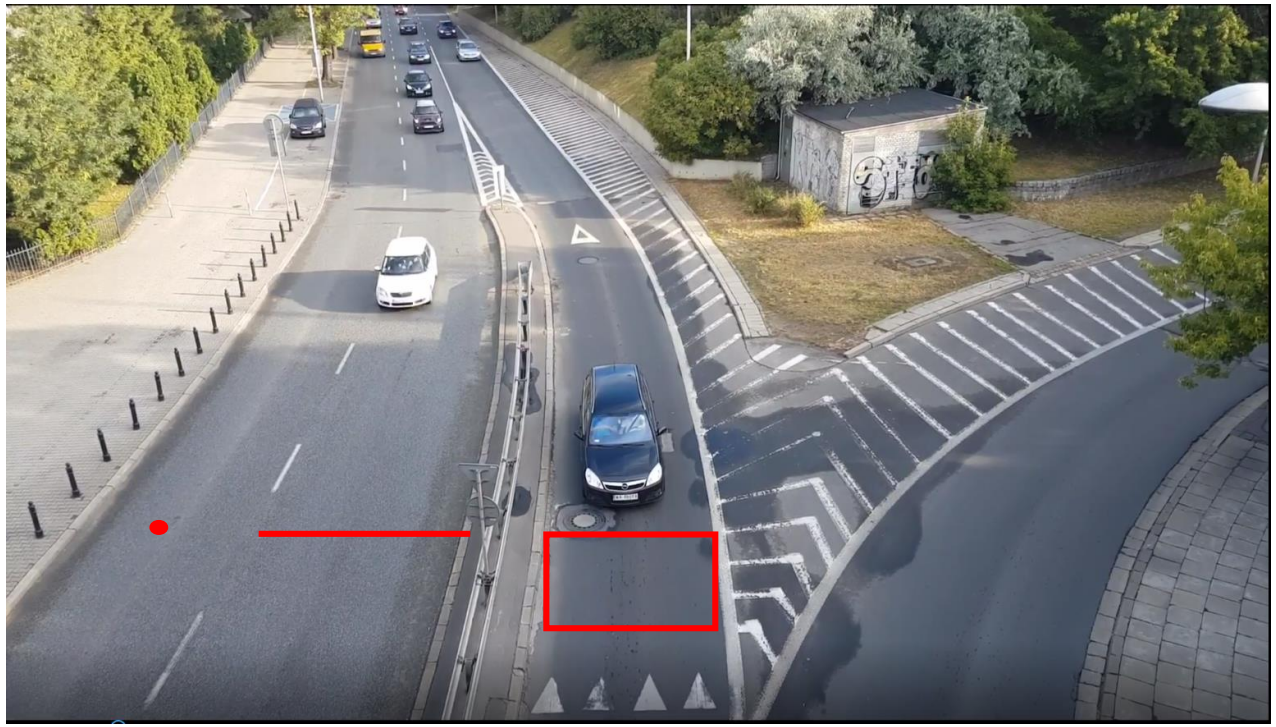
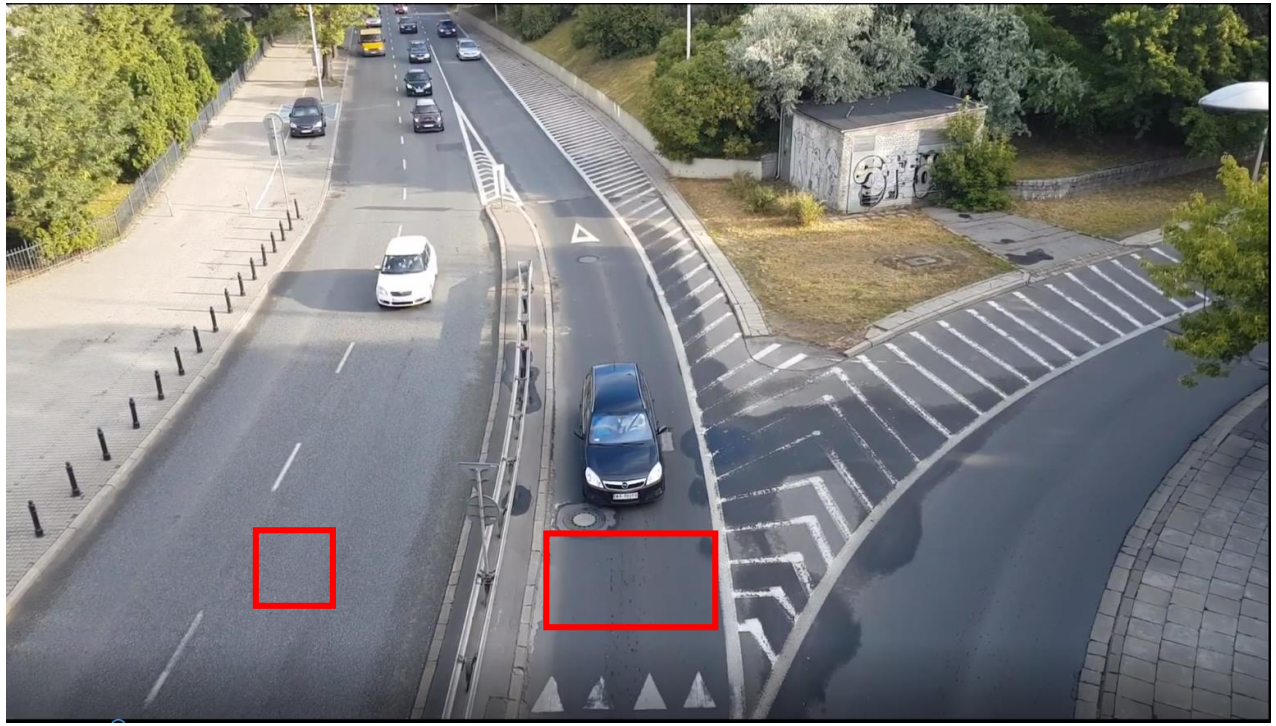
Choosing the method of detection

- Point (fast)
- Line
- Block (accurate)



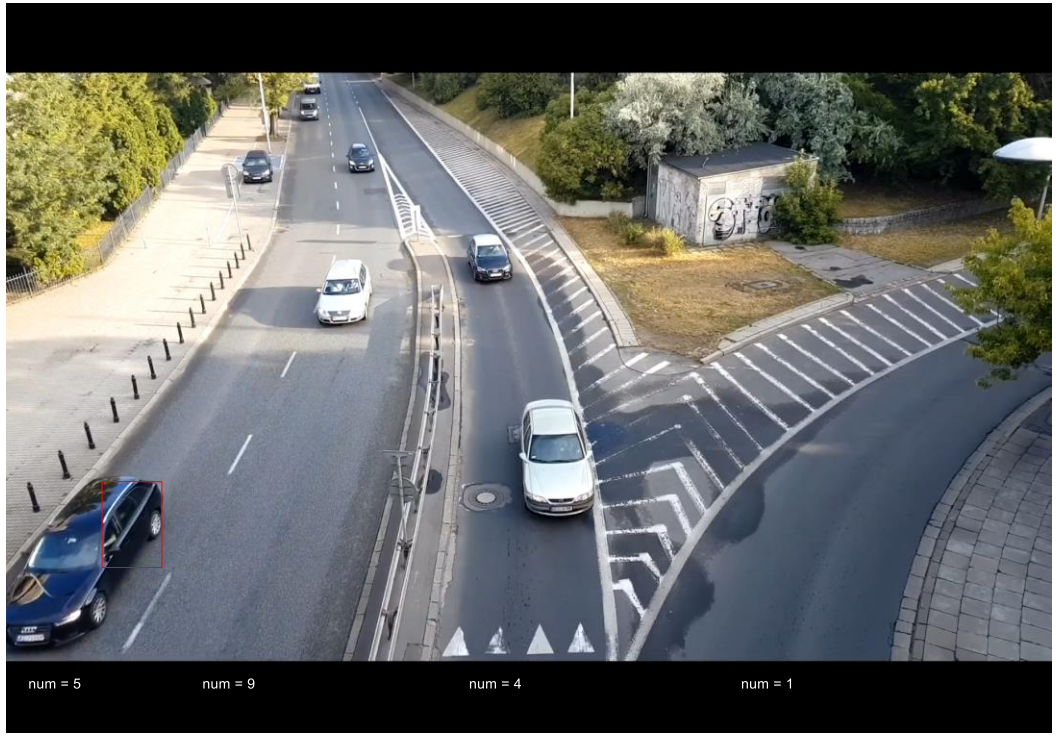
Optimization

- Choose different detect block based on different situation



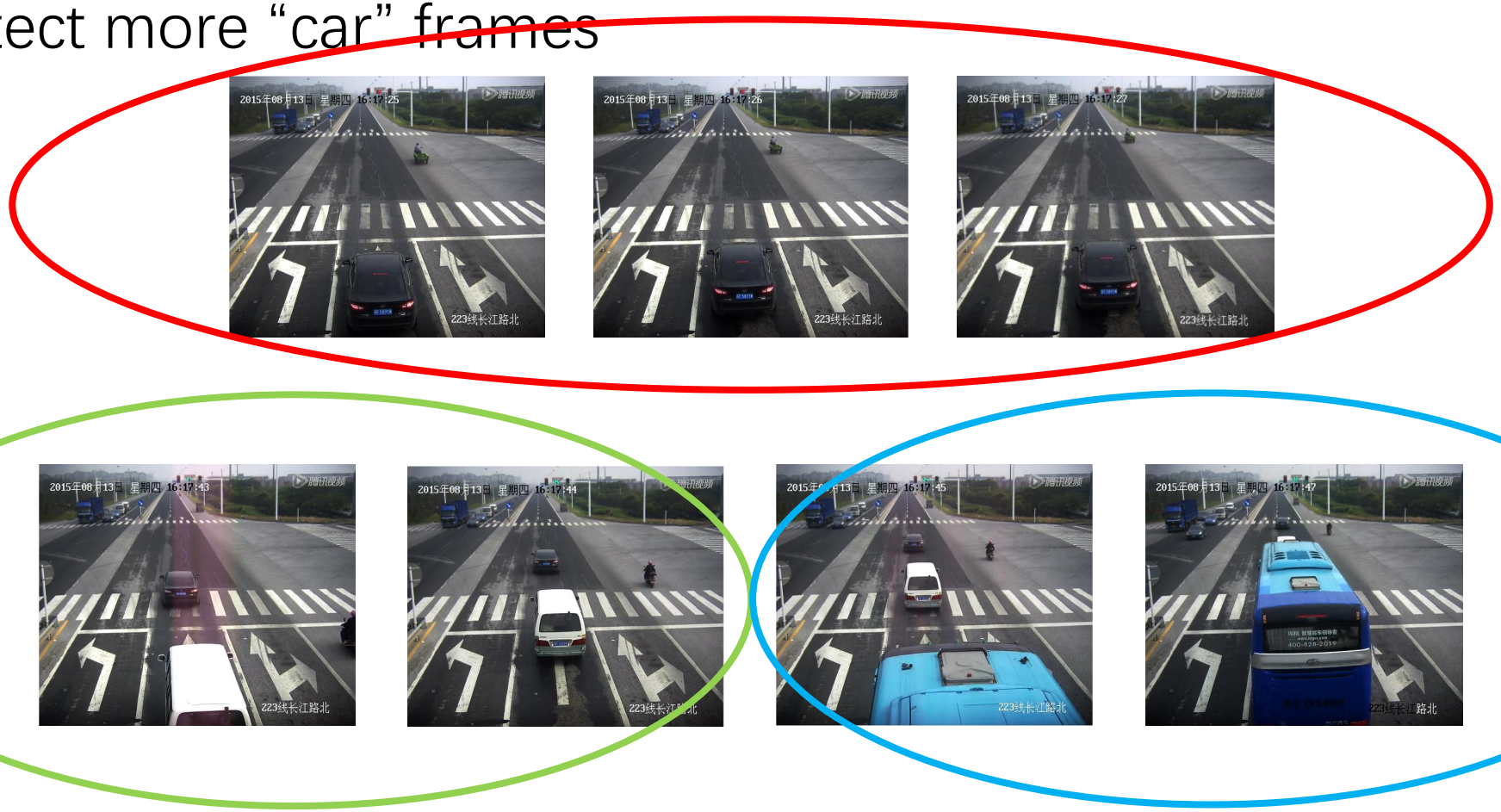
Problems of detection

- Missing detection
- Over detection



Problems of detection

- It detect more “car” frames



Problems of detection

- Caused by the light

Problems of detection

- Caused by the color of car

Problems of detection

- Caused by stuff in the car

Solution

- Enhance the foreground
- Tune the threshold
- Change the location of detect block
- Change the size of detect window

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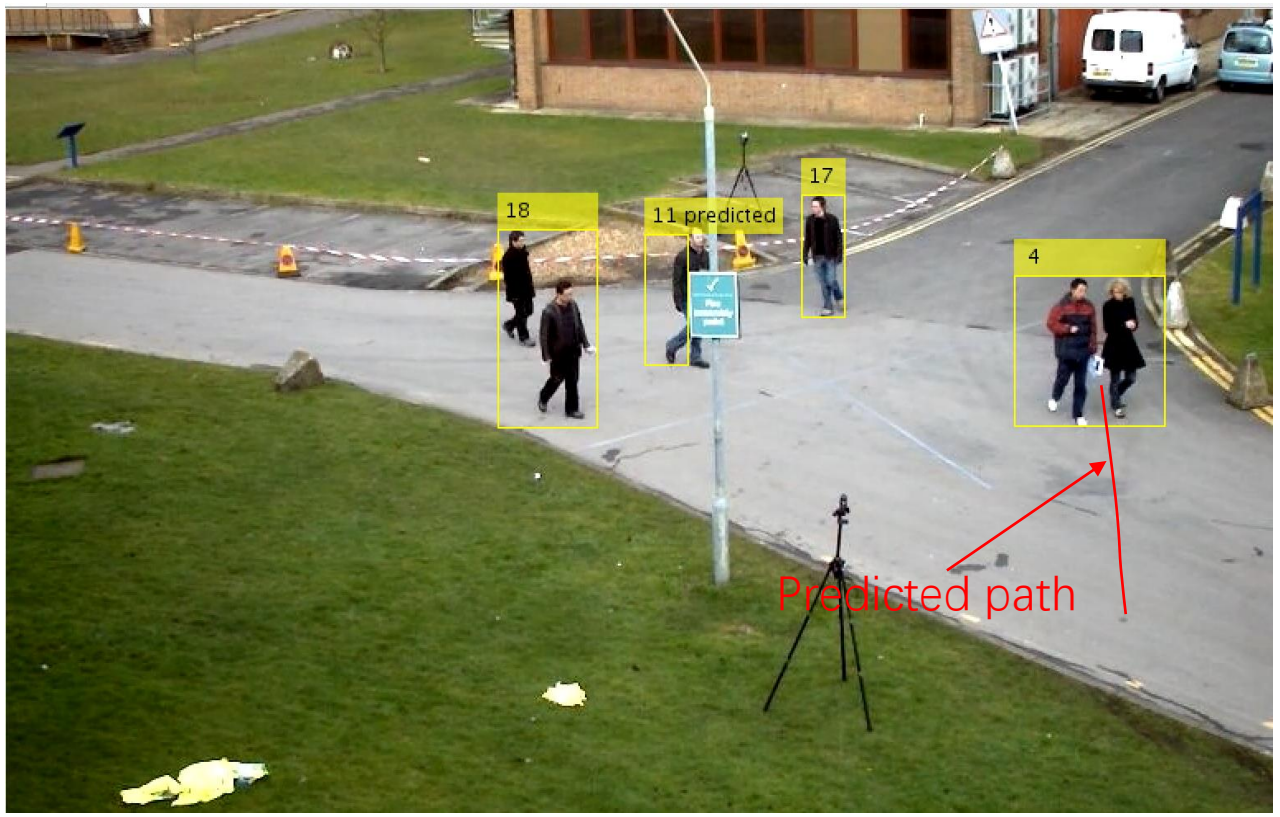
Tracking

- Automatic lane segmentation
- Vehicle type recognition
- Tracking
- Predict the path



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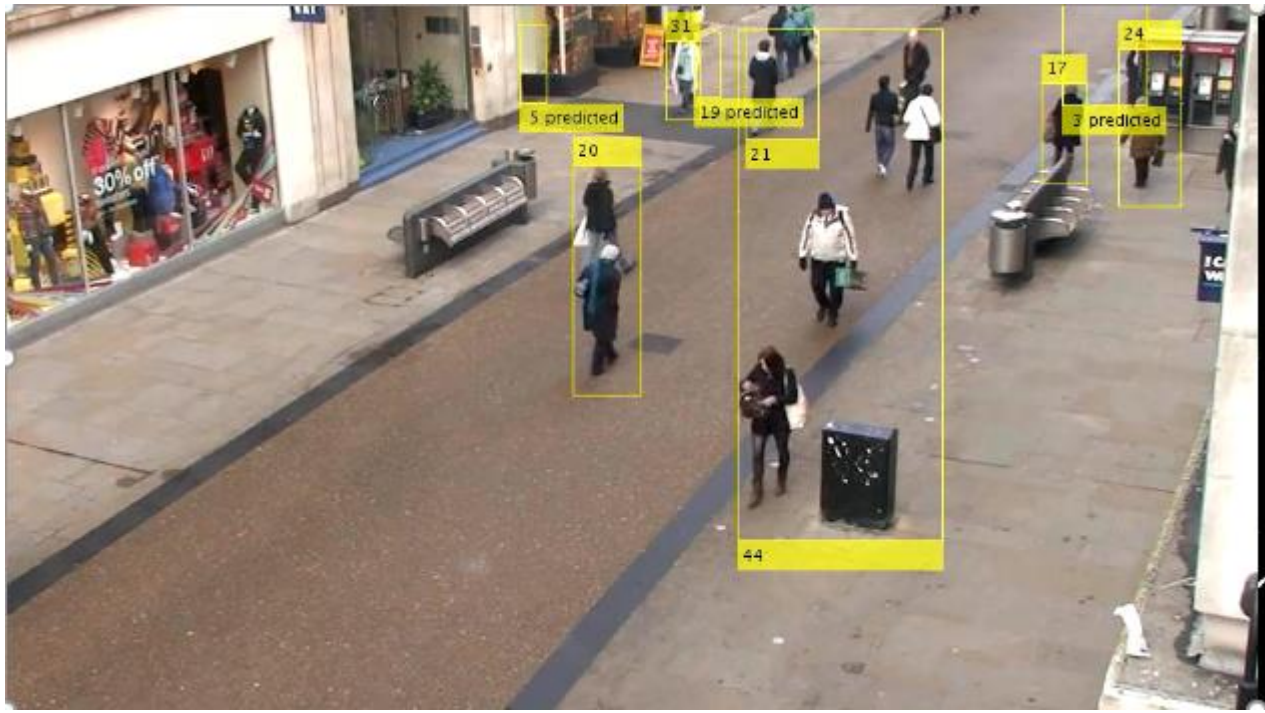
Prediction



Prediction

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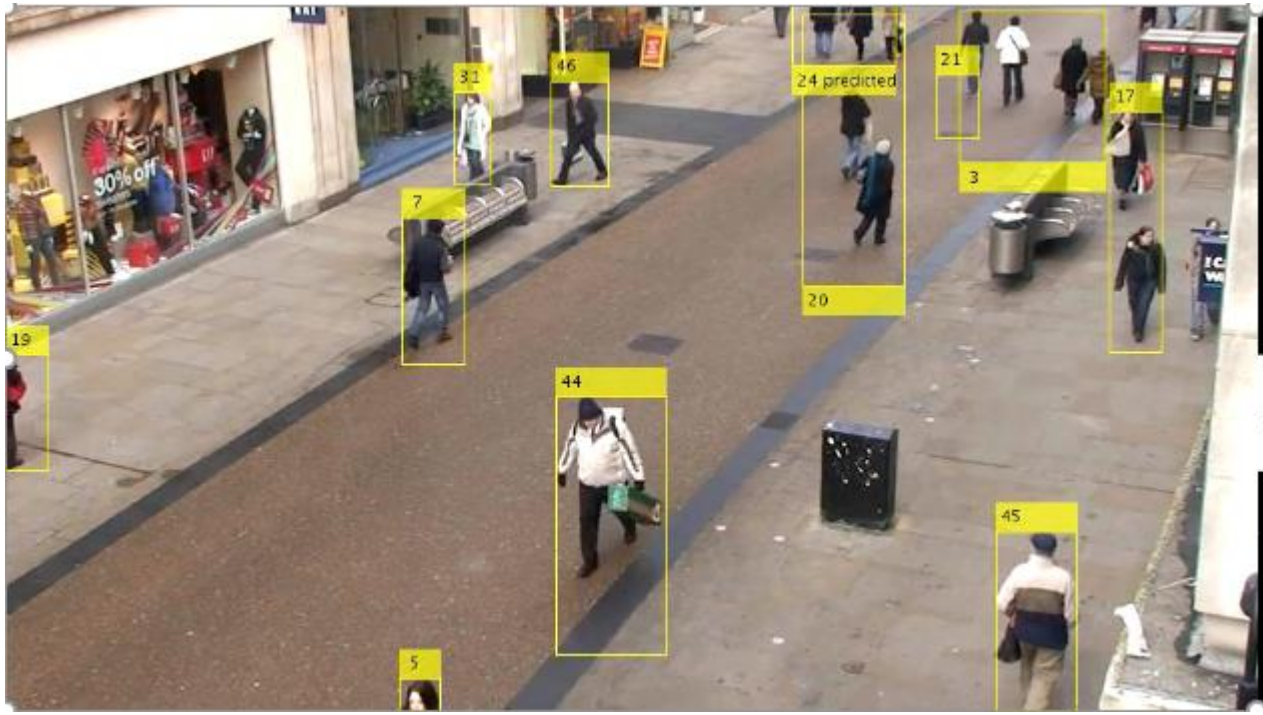

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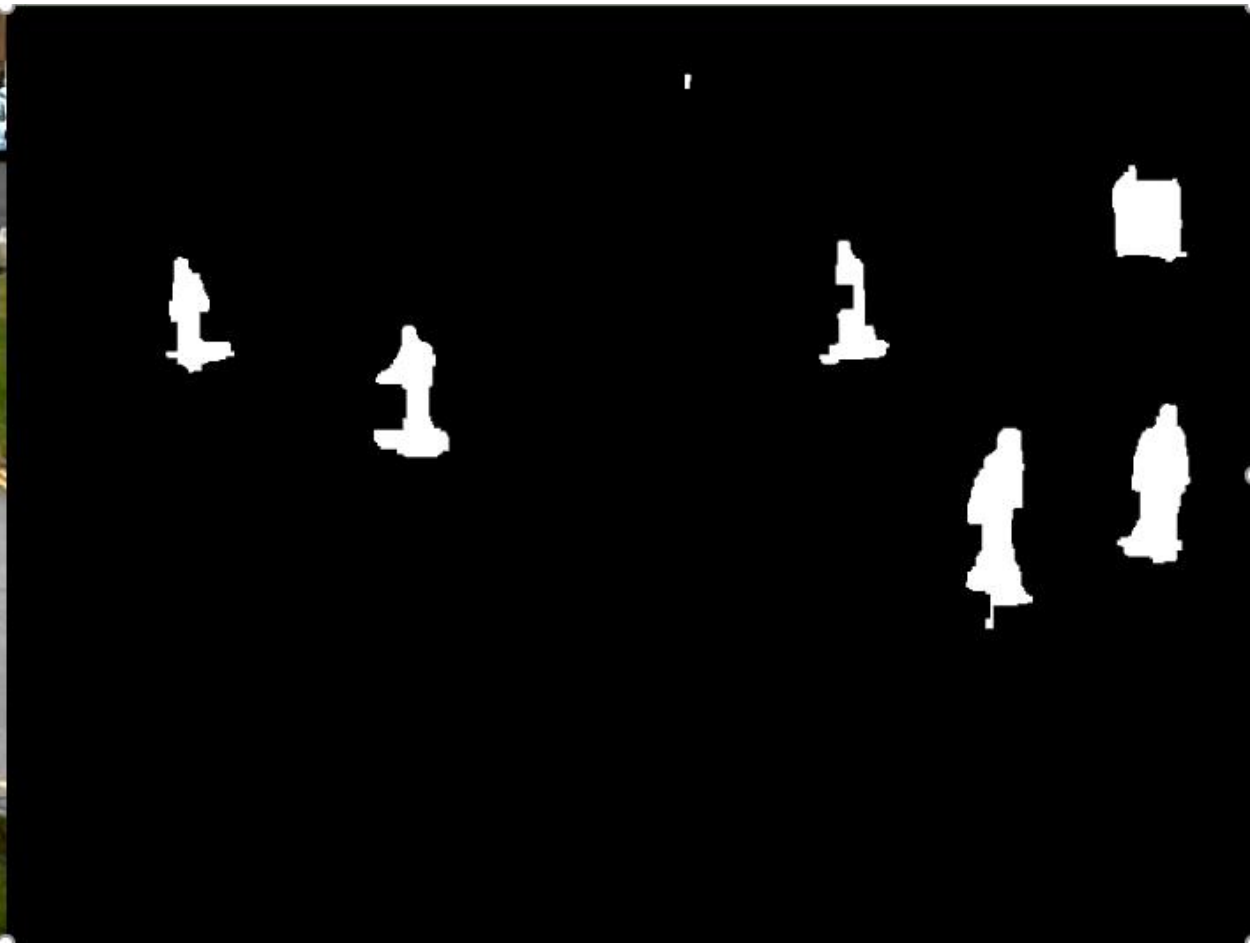

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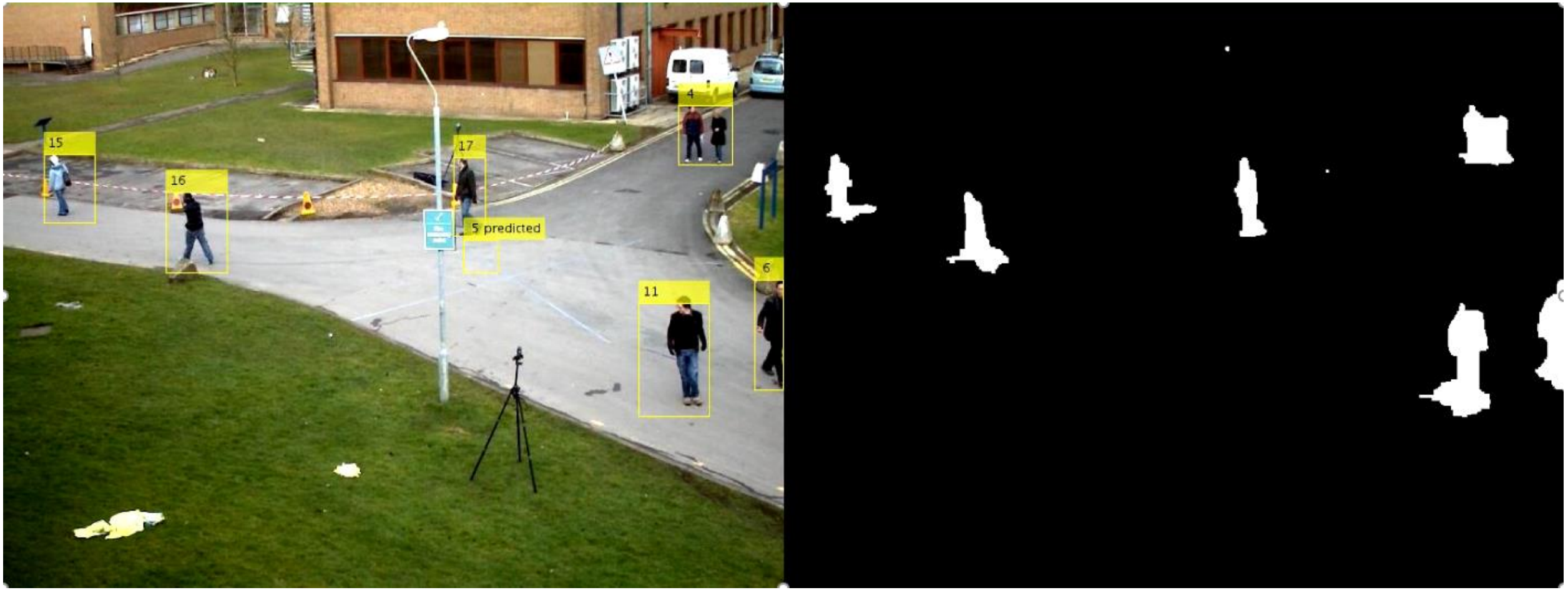

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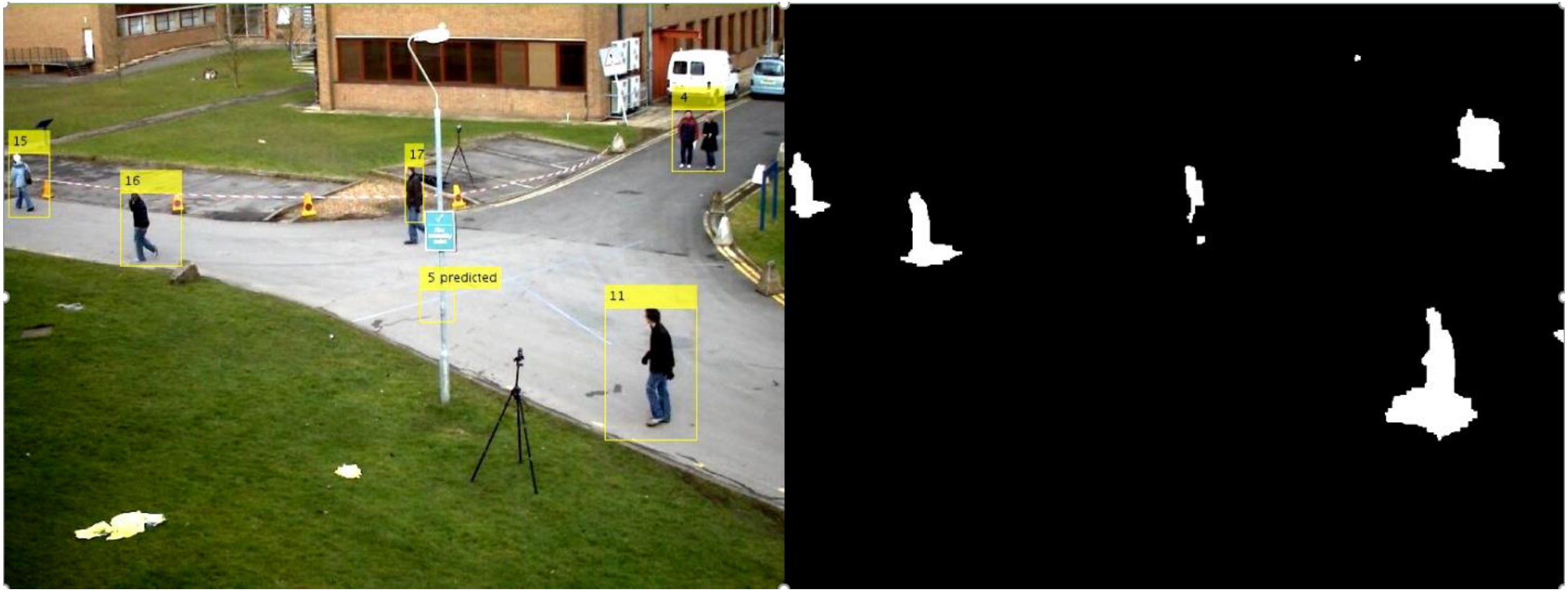
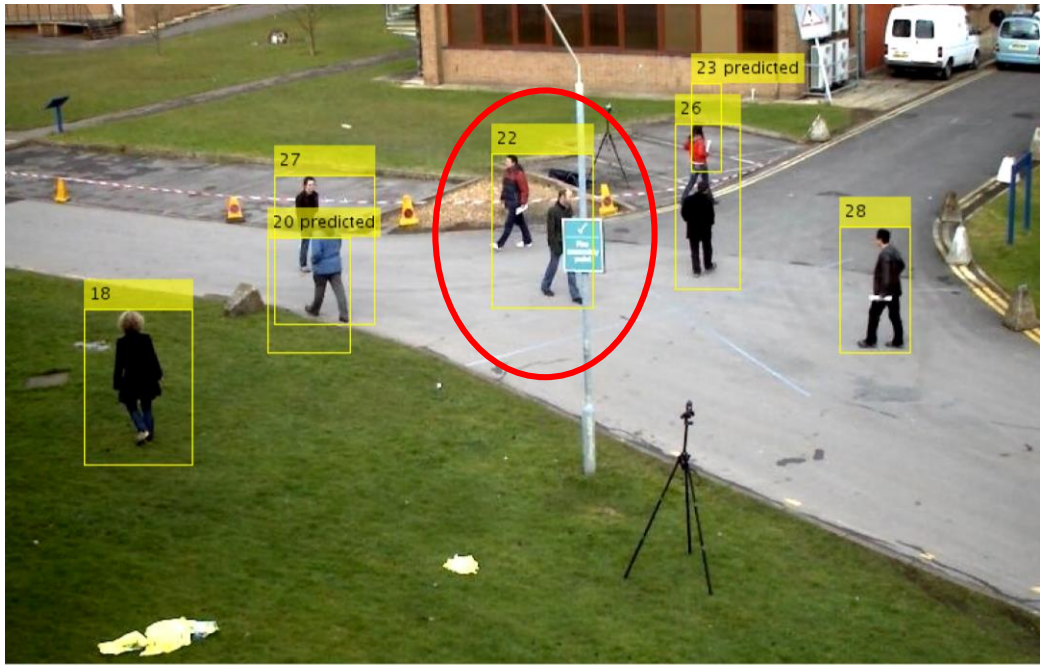


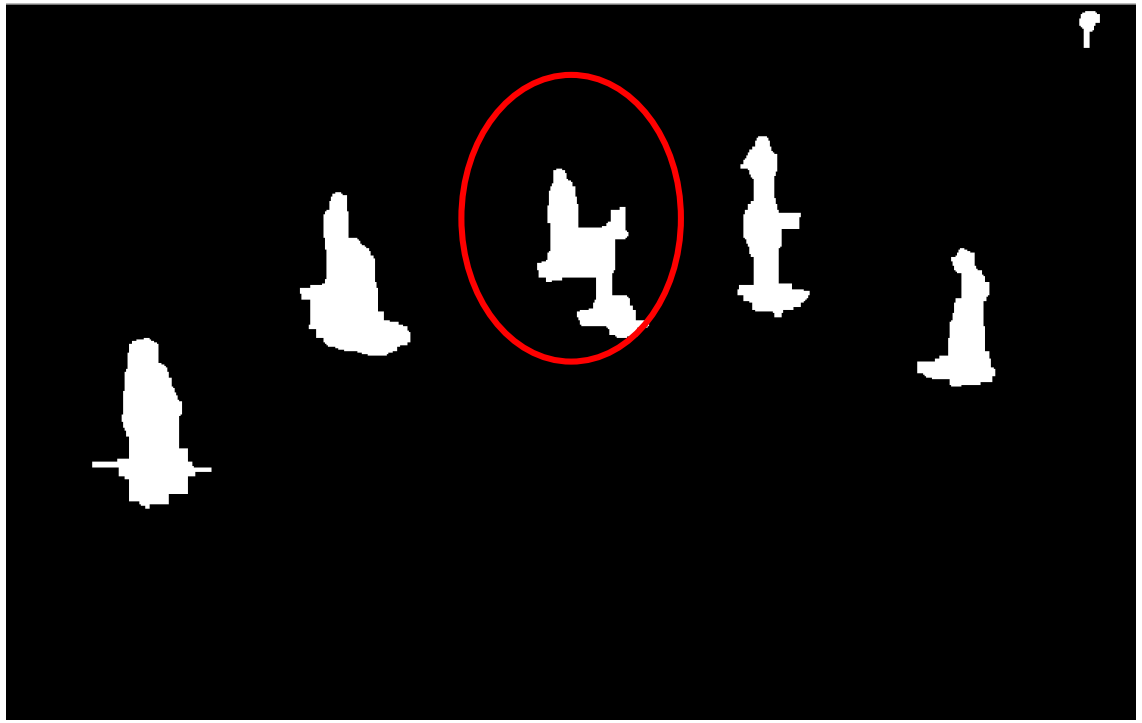
Problems

- Overlapping



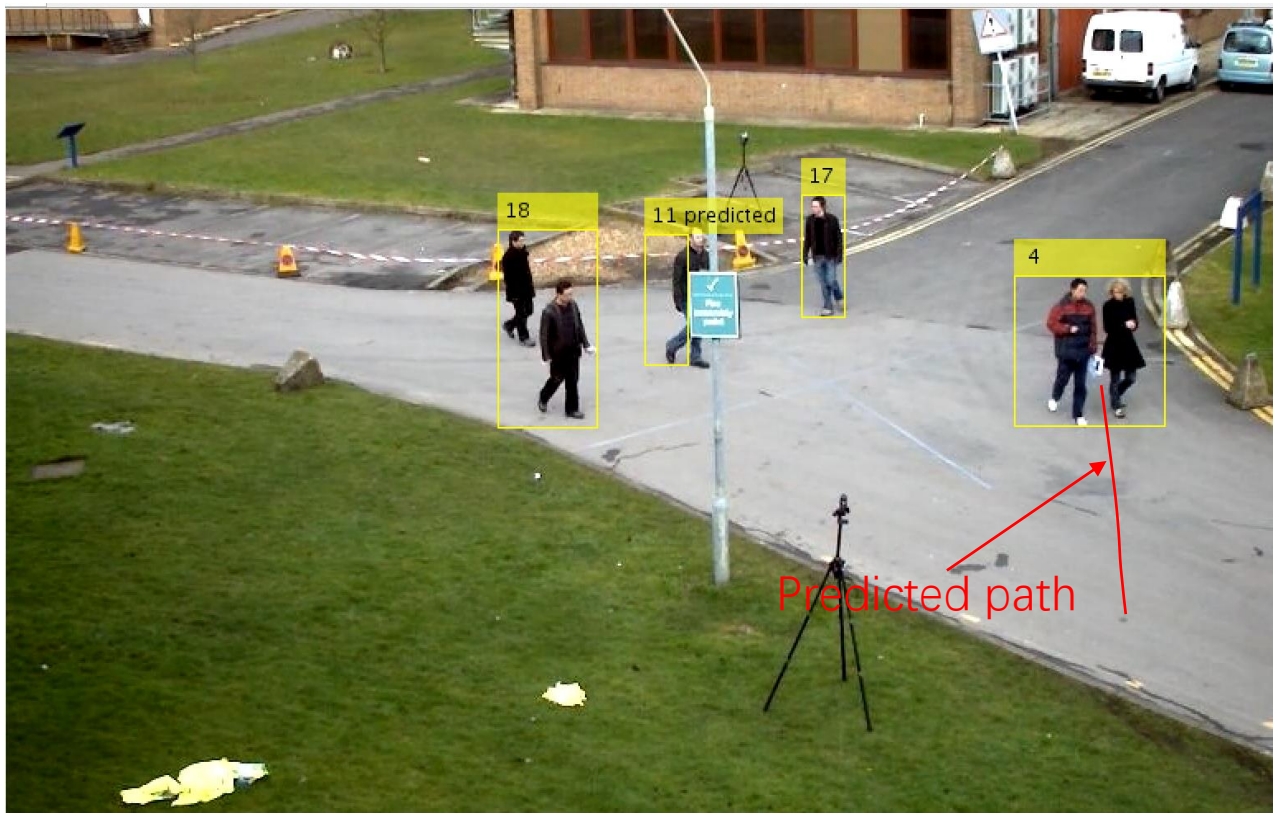
Solution

- Break the connectivity
  - Erosion and dilation



Improvement

- Automatic lane segmentation
- Vehicle type recognition
- Tracking
- Predict the path



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