

Object detection using Haar Cascade

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Object Detection

Object detection flow chart :

Image capture → Feature Detection → collecting putative points → object detection

Object Detection can be done using Haar cascade function.

The usage of Haar-like features in object detection is proposed first time by Paul Viola and Michael Jones in Viola & Jones

Haar features

Haar features are used to detect the presence of different types of features in the image, which is similar to the convolution kernels

A Haar-like feature considers adjacent rectangular regions at a specific location in a detection window, sums up the pixel intensities in each region and calculates the difference between these sums.

This difference is then used to categorize subsections of an image

Haar features

In the detection phase of the Viola–Jones object detection framework, a window of the target size is moved over the input image, and for each subsection of the image the Haar-like feature is calculated.

This difference is then compared to a learned threshold that separates non-objects from objects.

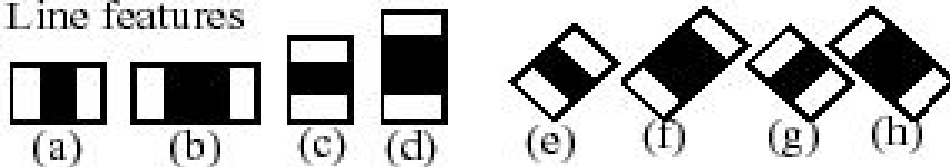
Because such a Haar-like feature is only a weak learner or classifier , a large number of Haar-like features are necessary to describe an object with sufficient accuracy.

Haar features

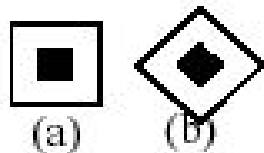
1. Edge features



2. Line features



3. Center-surround features



The Viola Jones Framework

The Integral image

Establishing the integral image can be helpful in calculating the intensity of a certain region in the image in constant time. It can be generated by the sum of intensity values in a rectangular subset of an image

The Viola Jones Framework

Adaboost

Adaboost algorithm, which is a kind of machine learning algorithm, can be adapted to remove the un-useful features

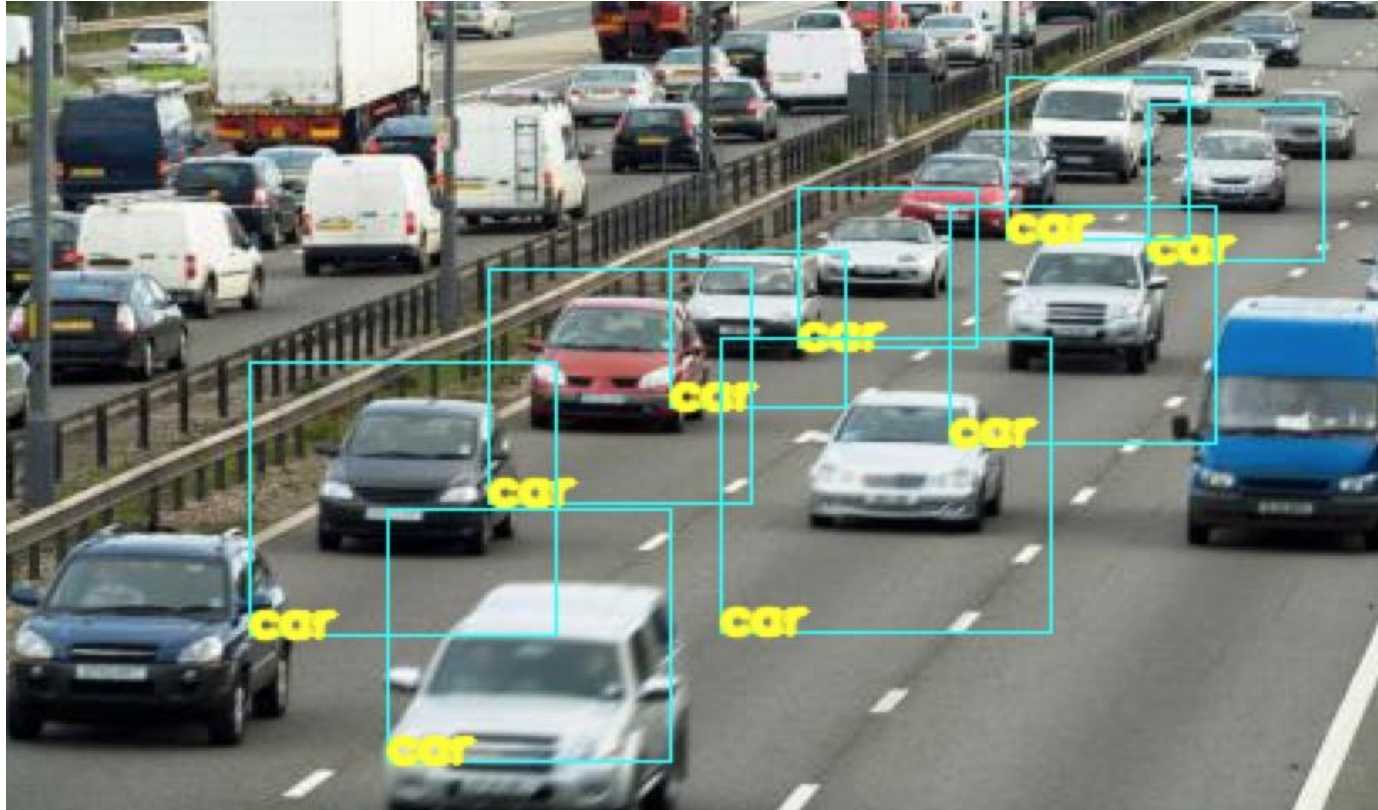
Each of the selected features are considered reasonable to be included if they perform better than the random guesses

The Viola Jones Framework

Cascading

cascading provides an efficient way to discard the non-target object features quickly and spend more time on the probable regions.

Object Detection : Results



Object Detection : Results

