Object detection via Implementation of Haar Cascade Algorithm

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Research Paper

Object Detection Using image Processing Fares Jalled et al., Moscow Institute of Physics & Technology, 2016

1. Problem statement

The main objective of the project is to develop an OpenCV-Python code implementing Haar Cascade algorithm for object and face detection. A drawback in object detection to overcome is that sometimes the objects are not properly detected which could cause unwanted results. To increase the success rate of detection, this algorithm will use cascade object detector function and vision.train function to train the algorithm. Another advantage of this approach is the reduced processing time.

2. Methodologies

The project is to detect a face to track.

Before we begin tracking a face, we need firstly detect it. This approach will implement the Viola-Jones detection algorithm and a trained classification model for detection. By default, the detector is configured to detect faces, but it can also be configured for other types of objects.

Ideally the face detector should track the face across successive video frames. However, the tracking may be lost when the face tilts or the person turns his head due to the property of the trained classification model used for detection. To avoid this issue and the costly computation for performing face detection for every video frame, the facial feature should be used.

2.1 Haar-like features

The idea behind the Haar Detection Cascade is to eliminate negative examples with very little processing. A series of classifiers are computed to every sub-region in the image. If the sub-region does not pass all of the classifiers, then the image is released and further computation is going to

be performed.

Haar-like features are an over complete set of two-dimensional Haar functions, which consist of two or more rectangular regions enclosed in a template. The feature value f of a Haar-like feature which has k rectangles is obtained.

2.2 The Viola-Jones framework

There are 3 main Ideas behind the viola Jones framework they are : Integral Images, which are used to calculate the intensity values in a rectangular window of an image , Adaboost which is for training the classifier and additional cascade structure which is used to combine the classifiers.

3. Datasets and Experiments

we will be using different types of Datasets to train the model including face detection , vehicle detection and some other simple objects detection. We conduct Experiments on different images and videos to benchmark the efficiency of the model.

Responsibilities

Lin will be responsible for training and testing of face detection and some other object detection and Prajwal will be responsible for training and testing vehicle and other objects detection.

References

[1] Object Detection Using Image Processing , Fares Jalled et al., Moscow Institute of Physics & Technology, 2016

[2] Research of Usage of Haar-like Features and AdaBoost Algorithm in Viola-Jones Method of Object Detection , Experience of Designing and Application of CAD Systems in Microelectronics (CADSM), 2013