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Study and Documentation of the Training Process necessary for the operation of the Visual Detector known as Viola & Jones.

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Abstract

The Real-Time Face Detection Method presented by Paul Viola and Michel Jones is perfectly adaptable to any class of object of interest, such as people, animals or vehicles¹. The flexibility offered by the method is directly dependent on its offline step constituted by the previous training of the informed database. The study and detailed documentation of the process of research and development of the method has potential since once the process can be standardized, it is possible to use it for several scenarios, only by changing the input parameters. In this way, unfamiliar users could use this powerful detector in different scenarios.

Key words:

Visual Detector, Real Time, Previous Training.

Introduction

Motivated by the difficulty found in Computational View when face detection was applied in real time, Paul Viola and Michel Jones³ demonstrated in 2001 an offline method that, although presented as a face detector, recognizes the most diverse classes of objects in real time, using Pattern Recognition Techniques, Integral Image, and Cascade Classifiers. This can be made possible because an offline training process occurs with the database informed by the user.

The present work proposes to directly assist the research and development process of applications directed to the real time visual tracking, carrying out the process of study, documentation and development of a method in Shell Script, aimed at the Linux Operating System, that automates the process Of object recognition training in an easy and uncomplicated way, once the user provides a sequence of dynamic and disorderly images in video format. As a result, it is possible to observe each step of the process and generate a set of files applicable to the generic Visual Detection program available in the OpenCV Library¹ in its version 3.0.1, which allows the use of a camera as a real-time detection object.

Results and Discussion

Performing the Object Detection process on a sequence of dynamic and cluttered images is a crucial task for real-time recognition. To perform this process it is necessary to obtain two different collections of images. Positive Images are obtained according to the demand of the recognition, and Negative Images have a differential: they are clippings of images of any class, that do not have the object of search. In this way, the creation of a method that allows to modify only the input parameters is a potential problem for applications focused on Object Recognition.

By having a previous training process, it is necessary that the Positive and Negative Images are correctly defined, which is a costly process, precisely because of its flexibility and variety. Therefore this article covers the implementation of two software for selection of Negative Images, facing towards at the creation of the adapted background model and Negative Images

clipping. For cutting Positive Images is used an existing free software known as Imageclipper². During the study process, documentation and development of the Script, software were used for the expansion of the positive database, creation of test images, training of Cascade Classifiers, obtention of applicable files to each classifier and evaluation in real time, both native Of the OpenCV Library¹.

When using as input parameter a sequence of dynamic and disordered images in video format, lasting 19 seconds, it was possible to perform positive image clipping manually and apply to developed software and obtained from image processing, automatic algorithm process. Under these conditions, a database with an approximate size of 4500 Positive Images and 6200 Negative Images can be completed. Considering this base as an input parameter of the software that apply Cascade Classification using 8 training stages, it was possible to observe that the application in these conditions can perform the image recognition in the expected way. Several tests were performed, varying in quantity, the database presented and, among other parameters, the number of stages. In this way, the feasibility of uncomplicated application of the method was obtained.

Conclusions

During the development and evaluation of the results, it can be observed that the objective of studying and documenting the training process necessary for the operation of the Viola & Jones Visual Detector was reached, since it was possible to use each step of the method in an uncomplicated manner, reaching The expected goals of the recognition of the presented objects. Future studies for this work consist in the adaptation of Negative Images to the initial data base, using advanced methods of background extraction.

¹ OpenCV, L. <http://opencv.org/> (accessed Jun 19, 2017)

² S,J. <https://github.com/JoakimSoderberg/imageclipper> (accessed Jun 19, 2017)

³ Viola, P.; Jones, M. IEEE. Comp. Soc. Conf. 2001, 1, I-I.