ACADEMIC
World Academic Union

ISSN 1746-7659, England, UK
Journal of Information and Computing Science
Vol. 11, No. 4, 2016, *pp*.270-280

Providing a Method for Object Detection Using a Combination Category

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(*Received May 12, 2016, accepted August 21, 2016)*

Abstract. The object detection systems in an image, refers to systems that will find an object in an image completely mechanized and automated. These systems are often searching a particular object (which is known) in a raw image. These systems are often involved in two separate categories: (a) image processing, and (b) pattern recognition. The first issue involves the extraction of meaningful and valuable features. While the second issue involved finding a suitable learning model, so that it separates the object data from non-object data in a favorable and acceptable way. In this study, we have reviewed by three-step method of learning objects and using a multi-layered combination model for detection and using heuristic algorithms association rules for feature selection step and finally using a combination category method similar to the intensification of the final step there. And by reviewing various evaluation models, we measured the quality of our models. In this study, we showed that using a majority vote model is the best way to detect an object.

Keywords: object detection systems, classification, pattern recognition, learning object, heuristic algorithms association rules.

1. Introduction

One of the main issues in machine vision discussions is object detection. In recognition of objects in images, we can convert them to readable, understandable and processed data that it can be used in many applications, such as industrial, military and so on.

Object detection systems in an image, refers to systems, which find an object in an image in completely mechanized and automated way. These systems often search a particular object (which is known) in a raw image. These systems are often involved two separated categories: (a) image processing, and (b) pattern recognition. The first category involves the extraction of meaningful and valuable features. While the second category involved finding a suitable learning model in such a way that it separates the non-object data from object data in an acceptable and appropriate way.

These systems consist of two separate phases: a training phase and testing phase (ID). In the training phase, we provide at first an N series of object images (photos which content one object and it haven't got anything else) and an N series of non-object images. It should be noted that all the images are the same size. This series is called the training data set. In the next step, we convert the training images after pre-processing in to the training features vector. After this stage, we select some feature (remove some features) among the obtained characteristics in the previous step.

Then we perform a machine learning model on this data so that the model learns what will be the connection between selected features and an object / non-object image. In the experiment step, often a picture pyramid will be made (pyramid image will be for different image sizes) and each sub-image will be given as an object image candidate to the model to determine whether the candidate is an object or not.

Environmental issues, such as lighting conditions, image quality, and the background will cause severe hardships. For this reason, most of the time in the preprocessing step, we often use the integrated image. The challenge of identifying objects in images will be obtained from things diversity, their diversity in resolution, objects size diversity and objects rotating diversity.

Their diversity in resolution will be done with integrating image. Because of the existed rotating in objects, researchers have to use particular features that are independent of objects' rotation. Researchers have proven that histogram-based features are independent of objects rotating diversity.

As we aim to find the "face" object, we encounter by Face Detection. Face recognition is a key issue in most of computer-generated imagery and for face recognition; object recognition techniques will be used. Automatic face detection is as one of the main challenges in the authentication systems. The face of an object is non-rigid. The human face detection challenges of images are obtained from the human face diversity, such as race, resolution, facial expressions, face size, the head states and face tilt and darkness.

In this research, it will be tried to present a three stage learning object method (in this study, it means only "face" object or "machine" object "car" in the image). Educational stages consist of three parts. In the first part which is pre-process, we use a local binary pattern operator (LBP) to extract LBP for each training image that the obtained image will be called LBP.

In the second part, after obtaining a LBP image for each image, we consider LBP images which belong to the training object series as a training object series or positive class. Then, we obtain the maximum frequent patterns in this training object series with the MAFIA algorithm help. Among the obtaining maximum frequent patterns, a representative will be selected. This representative should have the most similarity to the rest. The introduced maximum frequent pattern as a representative is called the repeated positive class patterns or positive features patterns. In the same way, we obtain the patterns of negative features (or class of non-object). These obtaining patterns which are called the positive and negative features are being used for making a feature vector.

In the final part, we will finish the task by making an object detection. In making object detection, we use the obtaining positive and negative features patterns in the second part to identify the object. Making object detection includes the construction of several successive detectors with resonant mechanism and form a consensus. To strengthen this consensus for forecasting, we use object detection model with the help of color in another layer (second layer). For example, if the target object will be the face, object detection model with color help will use face authentic colors to detect the face. Also, in another layer we use positive characteristics to identify the matching amount with positive category and we use negative features for matching with the negative category. It means, we check the maximum frequent patterns in the positive category for the LBP image of a face potential image that few of them are available in this image, we also check the maximum frequent patterns in the negative category for the LBP image of a face potential image that few of them are not in this image.

These two values as double features can be used to detect the first layer of the face. The last layer, we use a consensus of learning model resemble to an artificial neural network (third layer).

Since, the most object detection models use one layer learning model patterns, one of the innovations of this research is the use of heuristic algorithms association rules for feature selecting step. Another innovative aspect of this research is the use of updated combination classification methods similar to intensifying in the final step. The most important innovation of the research is to provide a proposed framework for object detection (the object you want). Also, it will be tried that this proposed framework will be checked on at least two objects to verify this matter.

2. A review of the research background

Many Face Detection methods have been proposed [1] that these methods can be divided into three categories:

1 - Fixed and cognitive features methods

2 - Pattern matching method

3 –Learning based methods

Fixed and cognitive features methods are determined the facial features such as eye and nose and mouth and even the skin color and by considering the geometric relations, they form a group. Bhuiyan and colleagues [2] offered a method for converting pixels to color image by RGB method to YIQ method so by this method they can find the skin colors and categorized them into the skin region. Xiang and colleagues [3] provided a model to convert pixels from the RGB model to a R-G level to find the lip and skin color in images. When the skin region was set in an image, the components of the face or features such as eye, eyebrows, nose and mouth can be detected in these skin regions. The skin regions have been reported in appropriate face components as the face items. Lee and colleagues [4] used the conductive pattern and maps to determine the main features of the face such as two eyes and a mouth. Usually the review processes,