Object Detection System in Image Processing

Rameshwari Patil¹, Mona Mulchandani², Priyanka Dudhe³

*M.Tech Student, Computer Science & Engineering Department, JIT Nagpur, India*¹ Assistance Professor Computer Science & Engineering Department, JIT Nagpur, India² Assistance Professor, Computer Science & Engineering Department, JIT Nagpur, India³

Abstract

An object detection system finds objects of the real world present either in a digital image or a video, where the object can belong to any class of objects namely humans, cars, etc. In order to detect an object in an image or a video the system needs to have a few components in order to complete the task of detecting an object, they are a model database, a feature detector, a hypothesiser and a hypothesiser verifier. This paper presents a review of the various techniques that are used to detect an object, localise an object, categorise an object, extract features, appearance information, and many more, in images and videos. The comments are drawn based on the studied literature and key issues are also identified relevant to the object detection. Information about the source codes and online datasets is provided to facilitate the new researcher in object detection area. An idea about the possible solution for the multi class object detection is also presented. This paper is suitable for the researchers who are the beginners in this domain.

Keywords: object detection; localisation; categorisation; object recognition.

INTRODUCTION

Object detection (OD) system finds objects in the real world by making use of the object models which is known a priori[1]. This task is comparatively difficult to perform for the machines as compared to Humans who perform OD very effortlessly and instantaneously[2]. In this paper we will give a review of the various techniques and approaches that are used to detect objects in images and videos[4]. Basically an OD system can be described easily by seeing which shows the basic stages that are involved in the process of OD[5]. The basic input to the OD system can be an image or a scene in case of videos. The basic aim of this system is to detect objects that are present in the image or scene or simply in other words the system needs to categorise the various objects into respective object classes[7].

LITERATURE REVIEW

The OD system basically comprises of two main phases namely: the learning phase and the testing phase which are shown in Figure 2 that shows the normal working of the OD system[1]. Learning phase is mainly meant for the classifier so that it recognises the objects present in the image that is given as input to the system. Learning phase can be further classified as learning through training and learning through validation. Learning through training comprises mainly of the learning block where a proper learning scheme is defined, it can be part-based or patch-based, etc. The object template block then makes use of the learning's that were done previously to represent the objects with various representations like histogram representation, random forest representation, etc. Whereas on the other hand, learning through validation block does not require any sort of training as they are validated beforehand[5]. Hence after preprocessing the image, directly template matching is done which produces the features of an object in the image[3]. The main purpose of the testing phase is to decide whether an object is present in the image that is given to the system as input and if yes then to which object class does it belongs to. Here the image is searched for an object by various searching techniques like the sliding window technique, and according to the output of the searching mechanism, a decision is made on the object class.

MOTIVATION

Object Detection has been a well studied subject for decades since it arises in many practical scenarios of modern marketing and advertising. Object Detection aimed to enable computers to detect the object in an image without human intervention.

PROBLEM STATEMENT

Objects are key elements for companies and play essential role in the industry and commerce. Different objects may have similar layout but slight difference in spatial disposition of the graphics elements, difference in orientation, size and shape. Objects of different firms exist in the database. The object exit in text form, graphic form or in both i.e. hybrid form. Therefore it is necessary to extract the feature object of the object image as well as the test image so that it can identify the text portion and graphic portion of the object properly.

OBJECTIVE

To easily understand the nature of the object by detecting it.

METHODOLOGY

Object detection process splits in two parts: the first one is the data collections preparation, a set of objects and images for training and testing, and the second one is the real application. This part is resumed in the following steps:

1.Preprocessing: It includes binarization of images. Binarization is the process of converting an image from colour to black-and-white (called "binary image"). The binary image contain only two pixel values 0 and 1. This process reduces the number of dimensions we have to work with.

2.Feature Extraction: This process extract the key-points of all the objects. And extract the key-points of the input image with the same technique used to extract the key-points from the objects. Where keypoint is a circular image region with an orientation. It is described by a geometric frame of four parameters: the keypoint center coordinates x and y, its scale (the radius of the region), and its orientation.



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Figure 1.2 Keypoint in an image

There are many ways to extract features with reference of the goals. Some are based on the edges or on the corners, other on the curvature or on the shape. The various techniques for feature extraction are SIFT (Scale Invariant Feature Transform), SURF (Speeded Up Robust Feature), HOG (Histogram Oriented Gradient), Template Matching, etc.

3. Feature Matching: In this process, features of object which are stored in database are compared with the features of an input image. The regions with maximum similar features with respect to the object image is considered and hence the object in the image is detected. CDS (Context Dependent Similarity) is one of the technique used for matching the keypoints in the image and detecting the desired object.



Figure 1.3 Object detection in an input image

PROPOSED APPROACH

The process of object detection contains following steps:

1.1 Project flow diagram

Flow diagram for Object detection. It consist steps: pre-processing, feature extraction, and finally object detection.



Figure 3.1 Flow diagram for Object detection

The user inputs the test image and reference object image that is required to be converted into binary image. After binarization the current images is the images to which SURF is applied for extracting the features. Here, we are using SURF algorithm because from literature survey it is found that SURF algorithm is better than other techniques.

After extracting the features CDS (Context Dependent Similarity) is applied for matching the key points of the images. In this way, the object will be detected in an image.

APPLICATIONS

We will be able to determine the object properly and know the information related to it using internet.

CONCLUSION

A Boolean value determining whether the reference object .In our project, SURF algorithm will be used for extracting features and CDS for matching features as these techniques are efficient comparatively. It will to detect the object so dat we can be able recognize and know about the object.

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