RECOGNITION OF PARTIALLY OCCLUDED OBJECTS IN 2D IMAGES

ALMUASHI MOHAMMED ALI

UNIVERSITI TEKNOLOGI MALAYSIA

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ALMUASHI MOHAMMED ALI

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Dedicated, in thankful appreciation for support, encouragement and understanding to my beloved mother, my beloved father "Allah mercy", my beloved brothers and sisters, and beloved friend.

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ABSTRACT

Object recognition is spread across too many fields such as industrial, image retrieval and medical models. A human being can identify the objects with high performance and professionalism; on the other hand, a machine facing difficultly and effort to identify the object. In order to facilitate the process of identifying and analyzing objects easily using the machine, researchers worked hard to create new technologies and develop technologies that already exist for this purpose. The boundaries of computer vision are especially challenged by partial occluded object recognition. The aim of our research is to propose an algorithm using to recognize the partially occluded objects in two different cases: an object missing some part and objects are overlapping each other. The dataset that used in this research is silhouette images; we chose 60 images to represent the occluded object which missing part of the object. These images divided into three categories according to the percentages of the occlusion, and overlapping objects contains 36 images (each scene contains two objects). We collected those images from the MPEG-7 dataset downloaded it from the Internet. Adaptive Window is the purpose technique for extracting the features. Dynamic Time Warping (DTW) works for matching between objects. Orientation field is used to calculate the angle of a window's fragment. Algorithm goes through multiple stages, starting with the pre-processing through extract features from images and ends by comparing the images that enable us to obtain results of the matching, performance and efficiency of this algorithm. The experiments results demonstrate that the proposed algorithm is robust to identify missing and overlapping objects and it can work with strength occlusion.

ABSTRAK

Pengecaman objek telah tersebar meluas dalam banyak bidang seperti industri, dapatan semula imej dan model perubatan. Manusia dapat mengenalpasti objek dengan mudah secara profesional. Sebaliknya, mesin menghadapi kesukaran dalam usaha untuk mengenalpasti objek. Dalam usaha memudahkan proses pengenalpastian dan penganalisaan objek dengan menggunakan mesin, para penyelidik telah berusaha sama ada mencipta teknologi baru atau membangunkan teknologi sedia ada. Sempadan penglihatan komputer terutamanya dicabar oleh pengecaman objek oklusi separa Tujuan kajian ini adalah untuk mencadangkan algoritma yang akan digunakan untuk mengenalpasti objek oklusi separa dalam dua kes berlainan: objek yang hilang beberapa bahagian dan objek yang bertindan antara satu sama lain. Set data yang digunakan dalam kajian ini adalah imej bayang. Kami memilih 60 imej untuk mewakili objek oklusi yang hilang beberapa bahagian. Imej-imej ini dibahagikan kepada tiga kategori berdasarkan peratus oklusi. Objek bertindan mengandungi 36 imej (dengan setiap adegan mengandungi dua objek). Kami mengumpulkan imej-imej tersebut daripada set data MPEG-7 yang dimuat turun daripada internet. Tetingkap Penyesuaian digunakan untuk mengekstrak ciri-ciri objek. Lengkungan Masa Dinamik (DTW) berfungsi untuk memadankan objek. Medan Orientasi digunakan untuk mengira sudut kepingan tetingkap. Algoritma melalui beberapa peringkat, bermula dengan pra-pemprosesan melalui pengekstrakan ciri-ciri daripada imej dan diakhiri dengan perbandingan imej yang membolehkan kami memperolehi keputusan padanan, prestasi dan keberkesanan algoritma ini. Keputusan eksperimen menunjukkan bahawa algoritma cadangan adalah kukuh dalam mengenalpasti objek yang hilang dan bertindan, selain boleh bekerja dengan kekuatan oklusi.

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CHAPTER 1

INTRODUCTION

1.1 Overview

The use of object recognition is spread across too many fields such as industrial, image retrieval and medical models. This only serves to highlight the point that object recognition has becomes the single most important part of computer vision because through it finding and analysis an item in a video or image can be done. There are a great number of models and techniques that have been developed to do this, as long as the object being searched for is easily identifiable, recognizable and available for analysis. Methods such as chain code and histograms are used by the programs to find the object (Du, et al. 2004).

The boundaries of computer vision are especially challenged by partial object recognition and it can be broken down into different, varied categories. First we have recognition of a complete object, distorted object or an occluded object.

An occluded object was defined by Dir Bhanu and John (1987) as a phenomenon where two objects (or more) are over lapping each other or are within a given touch. However, this definition of occlusion is hardly comprehensive and if such an image was presented to the computer for recognition, it would not be able to

identify the object at all. The reason behind this could be the presence of distortion within the image or the lack of a certain basic configuration within the image. Every image is made up of pixels, sets of high-level and low-level features that define an image. When thinking in terms of pixels, trying to differentiate an object from the complete picture can be very difficult. It would be impossible to complete detection if there is overlapping presence, especially when depending on global features like color or texture histogram or shape descriptors. These methods can help in retrieval and classification that happens after object detection is complete (Piccinini, et al. 2012).

Every object can be described by using certain defined features and categories. If we can see the object clearly, then it falls into the first category in which all features can be extracted. In case the object cannot be clearly seen due to occlusion or a missing part, then it falls into the second category where it is not possible to determine what the object is or match it with another. This is due to the occlusion, missing piece or any damage that the object has taken. In the last group, the object cannot be seen because of complete occlusion and this makes it impossible to determine any features.

There are many reasons why recognizing and retrieving images from the defined sources has become easier than ever before. There was a shift towards digital photography and digital sources and a rapid increase in the internet usage that made the use of object recognition vital for the modern researcher. People have developed algorithms and programs that enable users to source images in quick and easy methods which have overcome difficulties and problems like occlusion.

1.2 Problem Background

When it comes to practical application of object recognition, the most

frequently occurring problem is missing or corrupt data present in digital images (Guo, et al. 2012). Scene understanding, object detection and image analysis are all affected by the presence of corrupt data. Objects that are occluded also cause many complexities in the recognition and retrieval of objects because there is part of the object that cannot be seen. Trying to recognize the invisible portion of the object requires using object tracking, image retrieval and targeting retrieval. There other applications and programs as well that try to use different recognition methods to work around occluded objects however, their accuracy depends on the level of occlusion.

It was decided that the best method for recognizing a partially blocked or occluded object was by pointing out the important boundary features of the unknown shape. This gave rise to a new set of problems where it was hard to determine which are the appropriate features that define the object? The method remained in the training stage and was carried forward in the localization and detection stages of the recognition process. It is still possible to recognize an occluded object while using certain characteristics of the unknown part that are based on the object itself.

When an image needs to found from a database of pictures, the object retrieval method is used. The process is remarkably similar to the manner in which a user would search for a certain product on a website. The user will submit a query (i.e. part of the image) and the results will be images from the database that similar to the submitted image, complete with a more accurate image description. The query image should include occluded objects or objects that are overlapping, and then the output will be an erroneous image description where the search engine would not be able to get correct results.

Occlusion problems happen to be one of the biggest problems when it comes to object retrieval and recognition. There are many images where numerous objects are present and they are overlapping each other and this greatly affects the images basic computations. Occlusion probability is considered as a part of hypothesis

verification and it includes the fact that certain expected features are missing and unexpected features have to be generated. When the amount of objects within the image increases, not only does the occlusion probability rise but the complexity of the recognition task also increases.

Two objects as shown in the Figure 1.1; the mobile phone is partially occluded by the book.

Figure 1.1 Occluded object

Now, we will use the Google search to retrieve the image which contains two objects, one of them is occluded which is mobile phone as shown in Figure 1.2. Figure 1.2 contains two objects in the scene, mobile which is partially occluded and book. The search engine only retrieves the book.

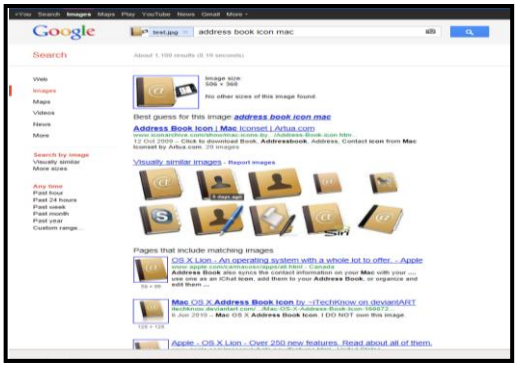

Figure 1.2 Retrieve occluded object

1.3 Problem Statement

The single objects recognition with fully shapes and features has been studied for a long period. It can be implemented easily by using many existing algorithms. Due to the impact of occlusion, this will cause a problem in recognition of the object. The occlusion occur when two objects or more are touching or overlapping each other or single object is missing some parts and these are the most common use. For example, in a factory environment are relying mainly on the machines, so this problem may cause some difficulties. Assuming that there are parts overlapped with each other in certain scenario. The computer vision system must be capable to recognize properly every occluded objects instead of reject it.

Considering that the occluded objects in an image is a single object, which a system can't identify these objects, these can be classified as a main problem. In addition, is it possible that the matching process can be effectively adjusted for the segmentation and recognition of occluded object as the same time?

1.4 Research Aim

In our research, the aim is to determine as to how to take out features from an occluded object as well as to distinguish objects from other objects and by identifying the methods to differentiate the occluded section and uses in retrieval of the image.

1.5 Research Objectives

Our research includes executes these objectives:

i. To propose a new technique of image retrieval for the occlusion.
ii. To retrieve the occluded object by using visible partial of the object.
iii. To employ Adaptive Windowing for features extraction and Dynamic Time Warping to determine the similarity.

1.6 Research Scope

Our research is concentrates on occluded object to recognize and retrieve it. The following describe the scope of this research:

i. This research concentrates on the partially occluded object with different percentages.
ii. This research concentrates on two dimensional objects and uses one for missing part and two objects for overlapping objects in a scene.
iii. This research concentrates on recognize and retrieve an occluded object.
iv. This research concentrates and uses silhouette image (binary) from MPEG-7.

1.7 Organization of the Thesis

This thesis is divided into five chapters. The first chapter describes the introduction and background of the problem, objectives and scopes of the

research. Second chapter, provides and gives a lecture review of the existing occluded object recognition, techniques to recognize occluded object and brief description of the image retrieval. Third chapter, methodology of the research. Fourth chapter, gives the initial results of the research. Fifth chapter, the research discussion and thesis conclusion.

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