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Machine Learning-based Shape Detection for Object Recognition and Tracking

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Abstract

Computer vision is a growing field of computer science that intends to extract some useful information from images, usually taken from cameras or scanners. The ability to recognize shapes in images is often necessary in computer vision programs. This article describes how to make a program able to recognize basic geometrical figures by using machine learning. This article shows the image processing stages until feature extraction; Giving to the reader an idea of how to apply computer vision for other problems that involve shape recognition.

Introduction:

Usually, there are some software looking for only triangle or only the circle in the whole photo or a particular shape given as an input to the system. The eye of humans also able to detect the shape which is in front them from the database which stored in the brain of humans, and they need to recognize the shape before doing any other operation or step. Researchers of detecting objects are agreeing that the information of area in a photo are important to extract the thing which called perceptual unit. Here some features could be detected and some texture as properties of signal might be sent to assist the system when taking a decision to any point detected if it is related to any shape or is not related to it. In the photos which have been taken randomly contain some shapes like rectangle could play a very important role as information to the shape itself which maybe a vehicle in this case. Other features of shapes just like the shape of human eye could be useful also because this kind of feature could help in detecting the human face because it has the same shape in all faces where other shapes could be related to any other object. In computer science, many researchers are focusing on shape detection because the shape is playing important role to recognize an object. Even in medical science, detecting shape is an important step to specify the diseases especially in analysing image for example the shape of organ maybe useful in specifying the diseases. Usually, we are looking for known and normal shapes but sometimes if the shape is incomplete or the shape looks like another shape, here we could not recognize which shape it is, so the information of the shape is important due to our vision, the system needs the complete information of the shape in order to recognize it. Specifying the shape is not that big problem but also it is not so easy to recognize and that is why we need the complete information of the shape. In computer science nowadays, retrieving photos has become one of the most interesting things of computer vision especially because of the huge number of graphical data which have been stored for the past few years. In these types of information and data the process of analysis depends on the

operation of recognizing the graphics to let the photo be classified especially when the symbols are available. Generally, there are many types of methods of detection and recognition depending on the kind of information. The approaches of statistic can be used for analysing the photos and they are really accurate but take a long time whereas if we try the structural approaches, we will gain more time because it will be faster than the statistical ones but here we must apply them very carefully to make them accurate. In object recognition, detecting the shape of object and recognizing it is very important because it will help the system to recognize the object itself in the given photo.

Proposed Algorithm:

We propose an algorithm for recognizing and detecting shapes in the photos. The proposed algorithm has been developed to recognize and detect many different shapes given in any coloured photo and even in black white photo and the approach of the proposed algorithm is depending on the Gray scale photos and even the coloured photos given as input for the proposed system will be convert to Gray scale photo and for enhancing the photo, a contrast limited adaptive histogram equalization applied on small areas in the photo and it has been enhanced by the histogram equalization, so our first level is to enhance the given photo and this technique of histogram equalization is known already for analysing the photo and enhance it. So, we have applied this technique on the photo which is in Gray scale level and after that we have applied the gaussian process of filtering which used and applied on the photo which resulted from the step of enhancing the photo in order to decrease the noising. In the proposed algorithm, we are tracking the boundaries of every shape given in the photo and after that we are going to label all the areas detected in the binary photo depending on the algorithm of labelling photo and it is going to scan the whole pixels of the photo and after that it is going to assigning primary labels to the pixels have value not equal to zero and recording the label equivalences in a union find table and using the algorithm of union find to record the equivalence classes where the algorithm of union find is applied for maintaining a set of non-overlapping number from a limited area of elements. After that we are going to label again the pixels depending on the equivalence classes which have been resolved.

After that we are going to detect and recognize every area which has been labelled from the other similar area by using the accounting of parameter of the shape factor where the shape factor is applied to detect and recognize the area which has been labelled even if it is a known shape or not and after that it will represent the kind of the detected shape in the case of known shape. The diameter represents the highest distance among two pixels in any labelled area or we can say in the exact boundary of area which has been labelled and the area represent the labelled area or region and the shape factor’s value represents a specific kind of a shape given in the input photo.

Conclusion:

The proposed system detected all the types of shapes which are known usually, and the system depends on the concept of dividing the image into areas where some areas will contain the shape and others will not contain the shape and after that the system will detect the factor of shape to recognize the kind of shape. We could even recognize the kind of the shape given in the input photo and after applying our algorithm on photos we saw that the algorithm gives very good results even if they are many shapes in one photo by depending on the value of the shape factor which is proposed in the current paper and if we compare our work with other works we could see that most of other works are focusing on detecting ang recognizing some specific shapes but our work is recognizing all the kinds of shapes and we can say that our system is working very well and gives good results finally.

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