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Texture and Shape based Object Detection Strategies

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Abstract

Objectives: To identify the Objects individually in an image. **Methods/Statistical Analysis:** The texture based object detection is done based on the texture available over the surface of the object and the shape based object detection is done based on the outline of the objects in an image. These two methods are used for the object detection in an image. **Findings:** Both of the methods prove to have their own advantages and limitations; so based on the applications the appropriate method can be applied. **Applications:** Biometric recognition, surveillance, Medical Analysis.

Keywords: Object Detection, Shape Detection, Shape Contexts, Shape Recognition and Detection, Texture

1. Introduction

1.1 Texture based Object Detection

A picture surface is an arrangement of measurements computed in picture handling intended to evaluate the apparent composition of a picture. Picture composition gives us data about the spatial course of action of shading or intensities in a picture or choose district of a picture.

Figure 1. Texture based object detection.

Figure 1 shows the object detection based on texture. Picture compositions are restricted that can be utilized to help in division or arrangement of pictures. For more precise division the most valuable components are spatial recurrence and a normal dim level. To examine a picture composition in PC representation, there are two approaches: Structured Approach and Statistical Approach.

Surface division is the key beginning stride for composition based picture recovery. Composition is the principle trouble confronted to a division strategy. Numerous picture division calculations either can't deal with surface appropriately or can't acquire composition. This paper depicts a programmed surface division calculation in light of an arrangement of components got from wavelet space, which are compelling in composition portrayal for recovery reason. Recreation results demonstrate that the proposed calculation can proficiently catch the textured locales in subjective pictures, with the components of every area removed also. The components of each textured district can be specifically used to record picture database with applications as surface based picture recovery [1].

1.2 Shape based Object Detection

Humans can identify some basic shapes of object like cup and bottle. Similarly in this shape based object detection mechanism we create some basic object models (outline shapes) in the database. The outline shapes were compared

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with the database shapes and basing on the comparisons the object present in the image can be detected as shown in the Figure 2.

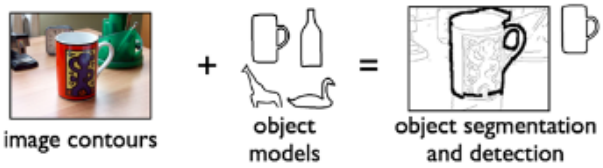

Figure 2. Shape based object detection.

In the field of PC vision object acknowledgment depicts the errand of finding and recognizing objects in a picture or video arrangement. People perceive a huge number of articles in pictures with little exertion, in spite of the way that the picture of the items might shift to some degree in various perspective focuses, in a wide range of sizes and scales or notwithstanding when they are deciphered or pivoted. Items can even be perceived when they are somewhat hindered from perspective. This undertaking is still a test for PC vision frameworks. Numerous ways to deal with the errand have been executed over various decades[2].

2. Methodology

2.1 Texture based Object Detection

A picture surface is an arrangement of measurements computed in picture handling intended to evaluate the apparent composition of a picture. Picture composition gives us data about the spatial course of action of shading or intensities in a picture or chose district of a picture 1.

The texture on the surface of the object in an image that can be detected using different techniques like Texture Segmentation, Region Based, Boundary Based and Edge Detection.

2.1.1 Texture Segmentation

The texture segmentation technique is also helpful to detect the texture on the objects in an image. The Texture segmentation is done in two different ways: One is region based and the other one is boundary based.

2.1.2 Region based

In this technique the particular image is classified into different clusters based on various parameters like color, brightness etc. Each pixel is assigned to a particular cluster based on the color and brightness. With the help of clusters we can detect the texture over an object in an image as shown in the Figure 3.

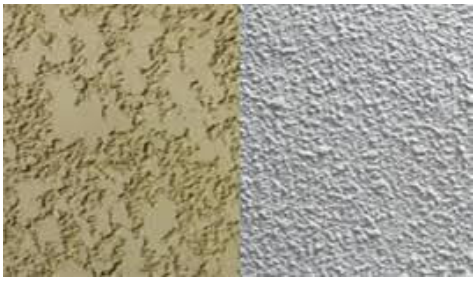

Figure 3. Region based technique.

In the image there are two regions the texture and regions is different so we can find the texture by grouping the similar pixels into clusters.

2.1.3 Boundary based

To overcome the difficulties in the region based segmentation, the boundary based segmentation is created. The boundary based image segmentation generally looks for the implicit and explicit boundaries between the objects in an image. The boundaries help us to detect the different textures in an image.

To perform the boundary based image segmentation there are several methodologies like Ridge detection and edge detection .The Ridge detection generally follows the maxima points in an image. The main disadvantage in ridge technique is it generates discontinues and missing boundaries between the different objects in an image[3].

2.1.4 Edge Detection

The edges in an image can be found by detecting the discontinuities in the brightness of the image. In this technique the number of pixels on the edges in the defined area helps to detect the texture over the object in an image. The direction of the edges detected also helps to detect the texture when they are plotted over a histogram as averages.

There are several edge detection techniques to detect the edges such as canny edge detection, thresholding and linking, edge thinning etc.

As shown in Figure 4 the texture of different objects is detected by using the edges of the objects initially and then the texture is detected by the direction of the edges in the image.

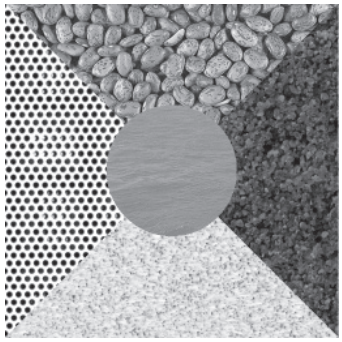

Figure 4. Edge detection.

Figure 5. Shape based object detection.

2.2 Shape based Object Detection

In the object detection, the shapes of the objects are widely used for identification, because the shaped images are easy to cluster and to perform the segmentation for finding an object in an image.

As shown in Figure 5, shape is generally used for the describing the boundary of an image. Comparing with the texture and gradient based representation, the shape based representation is more descriptive on larger images[4].

In this image (Figure 5.) the shape of the object is measured, this technique input image will be compared the existing image shape and the required object will be detected.

2.3 Difficulties that Occur in Various Circumstances during Shape based Approach

2.3.1 Template Matching

Template matching is a unique technique for identifying small parts of the objects in an image where some templates shapes are stored in the data base[5], and when an image is given as an input the template images will be compared with the every part of input image to detect the object in the image[4–6].

Figure 6. Template matching.

Figure 6 shows the template matching method which is generally used to detect numbers, characters, objects etc. This technique is used for both color and grey scale images.

2.3.2 Positioning

Position of the object in the image can be changed. It makes difficult to detect the object. Using the template matching the whole image was scanned and made to scan for the exact position of the object. The coordinates will be calculated by this technique and able to detect the required object.

3. Rotation based Object detection

We can identify different types of images which are in the various orientations. It gives an ambiguity to the system in detecting the orientated letters in the image. When some of the alphabets or numbers were rotated the original image will resemble like another letters. In this technique we were able to detect an object in the image by using the shape similarity or shape distance. By making the arc length of the image and calculating the shape distance we are able to identify the object in the image.

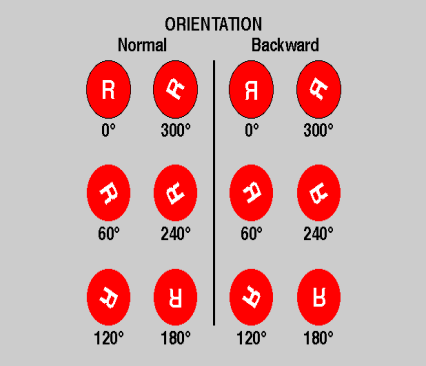

Figure 7. Rotation based object detection.

In image Figure 7, the characters are oriented in many different angles but all are same; so it generates ambiguity.

4. Results and Discussion

4.1 Texture based Object Detection

Figure 8 and Figure 9 show the implementations of texture based object identification and shape based object identification in an image.

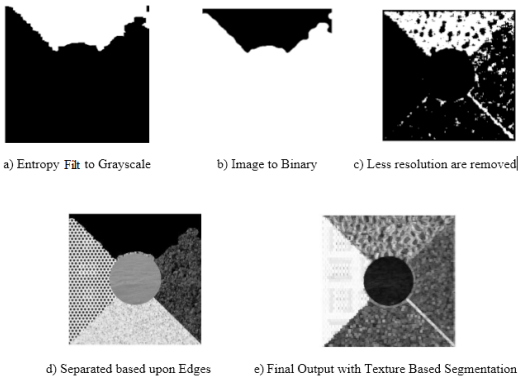

Figure 8. Implementation of texture based object identification. (a) Entropy filt to grayscale. (b) Image to binary. (c) Less resolution are removed. (d) Separated based upon edges. (e) Final output texture based segmentation.

4.2 Shape based Object Detection

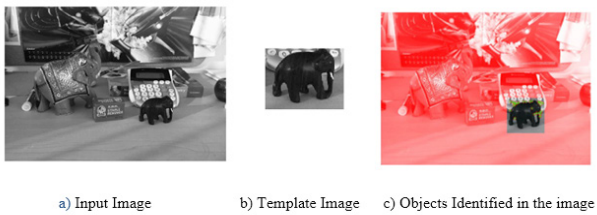

Figure 9. Implementation of shape based object identification. (a) Input Image. (b) Template image. (c) Objects identified in the image.

5. Conclusion

In this paper we discussed texture based object detection and shape based object detection and the different methodologies to perform those techniques. There are pros and cons for every techniques. The results depends on various factors like template size, pixel distribution, color, brightness etc. The best results can be found when texture based and shape based object detection methods are combined. It also increases the classification of objects and accuracy of the results. The techniques discussed in this paper helps for object detection which is widely used in image processing, surveillance and search engine fields.

6. References

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