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Automated Object Detection Using Deep Learning

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Abstract

Object recognition is one of the major evolving technologies with large leap strides in modern times. The object recognition focuses on performing segmentation of an image frame by segmenting image objects in specified enclosed boxes and applying filtering and creating frameworks for the same. The image segmentation encloses object isolating and helps in better classification because on training model alone on the segmented frames.

Keywords- Object Detection, Identical Shades, Identical Shapes, Identical Object , Threshold

I. Introduction-

Object recognition is an ever evolving technique with the advent of powerful machines. The state of art models/architectures are increasing every year. The image recognition is facilitated with the help of CNN layers and dense layers that are optimized and connected. The pixel array works as the input and is used for training various models based on convolution techniques that outperforms simple ANN networks. Further these CNN can work better if image segmentation is actively performed on the same.

Object identification becomes extremely more precise when the training is specifically done on the operative data(objects) in order to build up a discovery calculation for identifying various items in a picture. There are a few issues with object location like exactness, dependability, accuracy, and so on. What's more, there are likewise constraints of article discovery calculations utilizing it in programmed driving, security framework because of its model size, cost, and so forth.

Therefore, in our research paper, We have tried to propose procedures for quick and accurate object detection techniques like Global threshold, otsu's model, and the adaptive threshold for object recognition.

In this paper, the main focus is to recognize objects from a bunch of the other objects with the help of different techniques.

Diagram-

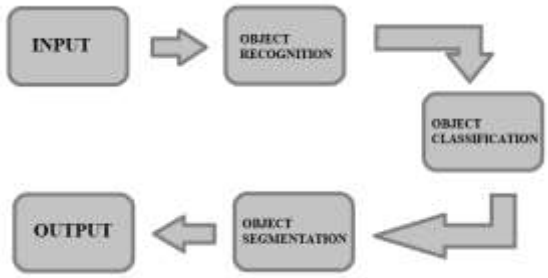

Fig 1

II. Object Detection schemes

1. Orthodox Approach

This approach is used to distinguish an object from other objects based on different properties.

Before deep learning, different techniques are used for object detection.

1. Proposal Generation

2. Feature Vector Extraction

3. Region Classification

1.Proposal Generation

The proposal is to detect objects using dynamic resizing boxes and enclose an object and use vector engrained algorithms to train and capture objects within boxes of varied shapes.

Fig 2

2.Feature Vector Extraction

The element contains a significant attribute of an article that portrays the item's highlights such as shape, color and soon .

3.Region classification

A region defines the area which is used to analyze an image for object detection based on height, shape, color, size and other properties. That region specifies a particular area of the image, where an object is detected.

It helps to distinguish multiple objects in a single frame.

2. Proposed Approach

Threshold : - It is a simple method for the segmentation of an image.

Fig 3

In the other words, Threshold is a process of dividing a single image or object into many parts based on different height, pixels , color , size and other properties. The threshold method change an original object or image pixel to a black pixel of the object or image .This approach is further divided : -

1.Global Threshold

2.Otsu's method

3. Distribution Threshold

1.Global Threshold

Global thresholding means a single value of pixel intensity threshold is used for all pixels in the images for converting it to binary image. This functions admirably just if all the pictures are taken under the same light conditions. Global Threshold Equation-

$$g(x) = \{1, f(x, y) > T \;\&\; 0, f(x, y) < T\}$$

f (x, y) = input image

g (x, y) = output image

T = threshold value

With the help of histogram we can reflect the image. The image divided according to the intensity of light, for the low intensity of light the histogram grows up

and vice versa.

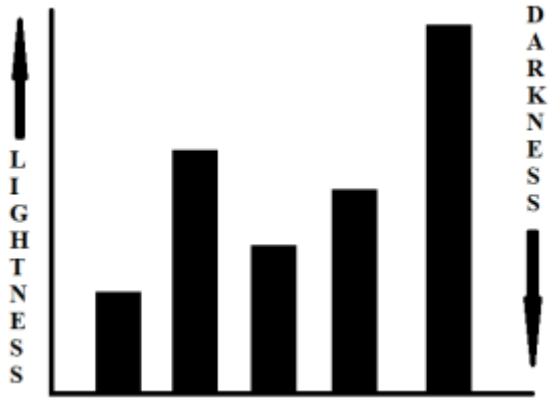

Fig 4

2. Otsu's method

The method is optimum in the sense that it maximizes the between-class variance, a famous measure used in statistical discriminant analysis .The fundamental thought is that thresholded classes must be unmistakable as for the power estimations of their pixels and, on the other hand, that an edge giving the best division between classes as far as their force esteems would be the best edge.

3. Distribution Threshold

With the help of a distribution threshold, we calculate an ideal threshold. In this, we divide the real image into small parts based on shape, size, height, colour and other . To calculate the ideal threshold, we need to calculate the probability of the target and background region and vector of target and background.

IV. Calculation

Step 1: Construct two values depend upon gray value of image and filtered image

$$p_{ij} = \frac{f_{ij}}{N}, \quad i, j = 1, 2, \ldots, L,$$

N = no. of pixels

L = gray level of image

$$\sum_{i=1}^{L}\sum_{j=1}^{L} p_{ij} = 1.$$

Step 2 : Calculate accurately the probabilities

$$P_{\mathrm{I}} = \sum_{i=1}^{t}\sum_{j=1}^{s} p_{ij},$$

$$P_{\mathrm{III}} = \sum_{i=t+1}^{L}\sum_{j=s+1}^{L} p_{ij},$$

P_I = probabilities of the target regions

P_{III} = probabilities of the background regions

Step 3 : Calculate vectors

$$\mu_0^* = \left(\mu_{0i}^*, \mu_{0j}^*\right)^T = \left[\sum_{i=1}^{t}\sum_{j=1}^{s}\frac{i\cdot p_{ij}}{P_{\mathrm{I}}}, \sum_{i=1}^{t}\sum_{j=1}^{s}\frac{j\cdot p_{ij}}{P_{\mathrm{I}}}\right]^T,$$

$$\mu_1^* = \left(\mu_{1i}^*, \mu_{1j}^*\right)^T = \left[\sum_{i=t+1}^{L}\sum_{j=s+1}^{L}\frac{i\cdot p_{ij}}{P_{\mathrm{III}}}, \sum_{i=t+1}^{L}\sum_{j=s+1}^{L}\frac{j\cdot p_{ij}}{P_{\mathrm{III}}}\right]^T.$$

u_0 = vector of target

u_1 = vector of background

Step 4 :

$$\mu_T^* = \left(\mu_{Ti}^*, \mu_{Tj}^*\right)^T = \left(\sum_{i=1}^{L}\sum_{j=1}^{L} i\cdot p_{ij}, \sum_{i=1}^{L}\sum_{j=1}^{L} j\cdot p_{ij}\right)^T.$$

u_T = total vector

Step 5 : Calculate trace matrix

$$\begin{aligned} t_r S_B^*(t,s) &= P_{\mathrm{I}}(t,s)\cdot\left[\left(\mu_{0i}^* - \mu_{Ti}^*\right)^2 + \left(\mu_{0j}^* - \mu_{Tj}^*\right)^2\right] + P_{\mathrm{III}}(t,s) \\ &\cdot\left[\left(\mu_{1i}^* - \mu_{Ti}^*\right)^2 + \left(\mu_{1j}^* - \mu_{Tj}^*\right)^2\right] = P_{\mathrm{I}}(t,s) \\ &\cdot\left[\left(\sum_{i=1}^{t}\sum_{j=1}^{s}\frac{i\cdot p_{ij}}{P_{\mathrm{I}}(t,s)} - \sum_{i=1}^{L}\sum_{j=1}^{L} i\cdot p_{ij}\right)^2\right. \\ &\left.+\left(\sum_{i=1}^{t}\sum_{j=1}^{s}\frac{j\cdot p_{ij}}{P_{\mathrm{I}}(t,s)} - \sum_{i=1}^{L}\sum_{j=1}^{L} j\cdot p_{ij}\right)^2\right] + P_{\mathrm{III}}(t,s) \\ &\cdot\left[\left(\sum_{i=t+1}^{L}\sum_{j=s+1}^{L}\frac{i\cdot p_{ij}}{P_{\mathrm{III}}(t,s)} - \sum_{i=1}^{L}\sum_{j=1}^{L} i\cdot p_{ij}\right)^2\right. \\ &\left.+\left(\sum_{i=t+1}^{L}\sum_{j=s+1}^{L}\frac{j\cdot p_{ij}}{P_{\mathrm{III}}(t,s)} - \sum_{i=1}^{L}\sum_{j=1}^{L} j\cdot p_{ij}\right)^2\right]. \end{aligned}$$

Step 6 : Calculate ideal threshold

$$(T^*, S^*) = \arg \max_{1 \le t,s \le L} \{t, S_B^*(t,s)\}.$$

V. Experimental Results-

Sample objects Detection Images

This sample image includes a weight plate, deo bottle, Doughnut , glue stick, tube, cup, square box and other. This sample is used to analyze the different objects with the help of above algorithms.

Fig 5

The given picture will be inspected with the help of the different algorithms :

Global threshold

Ostu's model

Distribution threshold

Comparative analysis of Different object Detection Techniques

Techniques	Accuracy (%)
1.Global threshold	**90%**
2.Optimum global threshold	**91%**
3.Otsu's method	**88%**

Table 1

VI. Conclusion: -

In this paper, I have discussed how the objects are detected through many processes. Furthermore, in object detection, there are numerous difficulties like the scenes are not satisfactory, the pictures are not clear and there are different difficulties to like a comparable kind of object. In this paper, we have used an improved

and fast with the help of segmentation techniques or algorithms and calculate an ideal threshold value for object detection. In segmentation techniques,

A threshold value is used to identify an object in a rapid and rigorous way.

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