2D Geometric Shape And Color Recognition Using Digital Image Processing

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Abstract- *This paper is an approach to identify basic geometric shapes and primary RGB colors in a 2-dimensionalimage using digital image processing techniques with the help of MATLAB. The basic shapes included are square, circle, triangle and rectangle. The algorithm involves conversion of RGB image to grey scale image and then to black and white image. This is achieved by thresholding concept. The area of the minimum bounding rectangle is calculated irrespective of the angle of rotation of the object and ratio of this area to area of the object is calculated and compared to the predefined ration to determine the shape of the given object. The dominant color pixels present helps to determine the color of the object. The practical aspects of this include reducing the manual labor in industries used to segregate the products and providing real time vision to the robots.*

Keywords- MATLAB, RGB Image, Bounding Rectangle, Shape and Color Detection.

I. INTRODUCTION

Individuals can without much of a stretch distinguish things or items dependent upon past taking in encounters. Case in point, when we take a gander at a picture with autos, ways, individuals, and building inside, we can tell which part is an individual or an auto, its shape, and even the brand of an auto or the sexual orientation of a particular individual. At the same time what do workstations accomplish for distinguishment? Might they be able to take in at what we did? Might they be able to specifically tell what's on computerized picture? If not, what would we be able to do to give machines the capability as we have ? Integral to question distinguishment frameworks are the way the regularities of images, taken under. As it were, all these calculations receive certain representations or models to catch these attributes, in this way encouraging methods to tell their characters. Shape is usually recognized regarding the set of forms that represent the limit of products. Contrary to position and structure centered representations, shape is more illustrativeat a bigger range, in a perfect world capturing the product of passion in general. It's recognized in the Gestalt school of recognition, which built the traditional of extensive quality in visible understanding. The central concept of feature-based object recognition methods can be found in finding attention factors, often occurred at strength discontinuity, that are invariant to modify due to range, lighting. The scale-invariant feature transform (SIFT) descriptor, suggested by Lowe, is probably one of the most widely used function reflection techniques for vision application.

II. LITERATURE SURVEY

Digital Image Processing means processing digital image by means of a digital computer. We can also say that it is a use of computer algorithms, in order to get enhanced image either to extract some useful information.

Image processing mainly include the following steps:

1. Importing the image via image acquisition tools;
2. Analysing and manipulating the image;
3. Output in which result can be altered image or a report which is based on analyzing that image.

The study in [1] was on the one of the main challenges in computer vision is to determine the number of different types, shapes, locations and color targets within the image plane for use in computer control systems. In that study, an algorithm introduced to detect the number of targets, their shapes and colors. A new technique presented as a digital indexing code table to present the studied color targets images. The indexing table technique depends on decimal and binary numbers. In that study, there were 42 different cases represents all the input images. There is a special case considered for the similarity of input images in case it has the sameshape and color, but a change in rotation and space between two image targets. This solved using referencing to indicate the same target in each case. Thus, the classification results were 100% for the presented algorithm for all input cases.

The study in [2] describes that pattern recognition is another field of examination, really, hypotheses and methods about it has created for a long time. In this venture, we'd get a kick out of the chance to present the fundamental idea, of division and distinguishment, utilizing the bolo dissection, The focal thought of this calculations lies in discovering investment focuses, regularly happened at force intermittence, that are invariant to modify because of range, enlightenment and an excellent transformation(Yang 2003). Where we attempt to read the image transform it to grayscale to work on the luminescence of the pixel using NTSC standard, applying the edge detection operations of find boundaries. Finding areas of objects and area filtering. Then applying the segmentation technique to get full details for each object that have been detected. Finally checking whether the shape has a corner or not, if it isn't, then it's a circle and must be check for the diameter it is satisfied the condition of that each point on the diameter has the same distance away. And if it is, then it either four or three corner and the same check done for both, just need to discover three or four sides of the expected shape and then examine the suitable of specified advantage points into the believed shape. For examining of blobs' forms we'll need to get their advantage points. For this purpose the blob keeping track of classification provides three techniques, which allow to get left/right points, upper\down points and all advantage points.

In [3] , the system was developed to detect and recognize different targets setting cases in the image depending on targets that differed in shape, color, and location. The algorithm focus on detecting 2D geometric shapes, color, and the location of the targets in the input image. This done by extracting red, green, and blue bands from input RGB-image and applied a median filter to eliminate image noise. A threshold process method applied to separate target from background then transforming the bands into binary to detect the number of targets in input image. The total cases studied are 42 cases but the total images are 261 because there are occurrences for each target. From the 42 cases, there are 36 images with two targets cases and 6 images for one target cases. The new idea within this paper is basedon using indexing to these cases.

III. PROPPOSED SYSTEM

The proposed system consists of many steps, they are mentioned as:

1. Reading/Capturing the Image.
2. Conversion of RGB Images into gray.
3. Identifying the boundaries of Objects.
4. Finding the Areas of Objects and Area Filtering.
5. Finding Corners, Detecting it and then recognizing the shapes.

3.1 Reading/ Capturing Images:

The image data file is a regular means of planning and saving digital images. Image data files are consisting of electronic details in one of these types that can be resterized for use on a computer display or publishing device. An image data structure may store details in uncompressed, compacted, or vector types. Once rasterized, an image becomes a lines of points, each of which has a wide range of pieces to assign its shade similar to along with detail of the device showing it.

3.2 Converting RGB image into Gray image:

This process is done in two steps. The RGB image is first converted to a two dimensional grayscale image. The grayscale image is nothing but a matrix that holds the luminance(Y) values of the image. We obtain the luminance values of the image by combining the RGB values using the NTSC standard equation that multiplies the primary colors(red, green and blue) with coefficients based on the sensitivity of our eyes to these colors as shown:

$$Y=0.3* R +0.59*G+0.11*B$$

The luminance image is then converted to black and white(binary) image by a process called thresholding, A threshold is set and the luminance of each pixel is compared with this threshold. All values that are greater than this threshold are replaced with a logical one(white) and the values below this threshold are replaced by a logical zero(black). The rhreshold can be calculated either by determining the luminance values of pixels that correspond to object regions in a sample image(machine training) and then averaging these values resulting in the threshold, or by using an algorithm that evaluates the histogram of the image and maximizes the variances of intensity between objects and backgrounds.

3.3Identifying Boundaries of Objects (Edge detection):

The image is a two perspective range with binary components. Boundaries of the object are identified by first setting a single pixel on the object-background user interface as a place to start and moving in a clockwise or counterclockwise route and searching for other object pixels. The pixel point may be explored either diagonally (in 8-connected pixels) or edge- adjacent points (in 4-connected pixels). By tracking for object points in a set route, the object's boundary can be identified.

Detecting sides is a primary function in image managing Edge recognition is an image managing strategy for choosing the limitations of factors within images. The sides tell you where pieces are, their dimension, outline and something about their structure. It works by finding discontinuities in lighting. In our proposed system we discussed the Sobel edge detection operator by processing an approximation of the slope of the image strength function. At each factor in the image, the result of the Sobel operator is either the corresponding slope vector or the standard of this vector.

3.4.Finding Areas of Objects and Area Filtering Once the object boundaries have been recognized, the area of that object can easily be calculated by summing the number of pixels within the boundary extent.

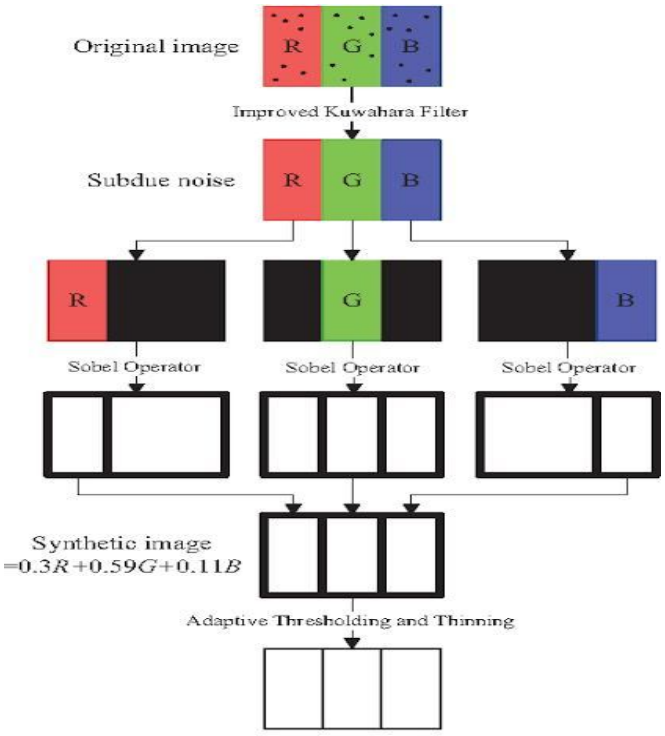
Very minute objects correspond to noisy pixels that may have been treated as object pixels during the thresholding process. It is necessary to remove these pixels before further processing. By using an if-else condition, those objects whose areas are below a threshold value, can be converted to background pixels (i.e., they can be inverted). In this way the image is filtered to remove small, isolated noise pixels.
3.5. Finding Corners, Detecting it, then recognizing shapes:

At the point when the information to a calculation is so extensive it is not possible be prepared and it is suspected to be infamous. Converting the information into the set of peculiarities is called peculiarity extraction. On the off chance that the peculiarities concentrated are deliberately picked it is normal that the gimmicks set will remove the applicable data from the information so as to perform the fancied errand utilizing this decreased representation rather than the full size info. It might be utilized as a part of the territory of picture transforming which includes utilizing calculations to distinguish and separate different fancied partitions or shapes (peculiarities) of a digitized picture or feature stream , utilizing Edge identification operation .now in the proposed system(as shown in figure 1.) we locate every personal product within the feedback image, that is finished victimization .The range with details regarding blobs contains such principles for every identified blob like its group, center of severity, mean shade, wide range of shades, etc. a wide range of these principles may be used for filtering of blobs. As an example, user might not ought to do any procedure of blobs that have too little detail or size. For examining of blobs' forms we'll need to get their advantage points. For this reason the blob keeping track of classification provides three techniques, which allow to get left/right advantage points, upper/down advantage points and all advantage points. Now we are able to begin with creating a kind detecting algorithmic concept, that ought to vision wide range of a kind for a given set of forms advantage points. For these reasons, we'll use the GetBlobsEdgePoints strategy, that provides all advantage factors, therefore the recognition may be a lot of improvements.

IV. COLORRECOGNITION FLOW DIAGRAM

It includes the steps and procedure regarding the color recognition which is done in a step by step procedural manner.Then the image colors are being subdivided into various operators mainly red, green and blue and further the synthetic image is being derived. After the various adaptive Thresholding and Thinning processes the image

colors are recognized and then differentiated.



V. SHAPE DETECTION ALGORITHM

The algorithm is the shape detection step by step procedure for the detection of the 2 dimensional geometric shapes, where it includes the image reading process and then converting them into the Grayscale. After the conversion the image then goes up to the edge detection and filtering process. The further process includes the corner checking and then distinguishing the basic shapes into various categories according to there specified corners and identifying there actual shape.

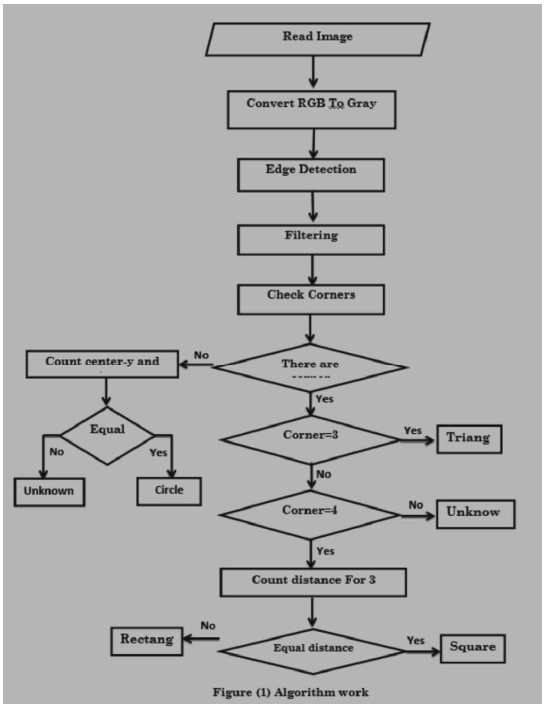


Figure (1) Algorithm work

VI. CONCLUSION

We examined the task of integrating color and shape, which forms the base of object detection algorithms. Supreme modern object detectors depend on the shape while overlooking color. Current tactics to augmenting intensity centered detectors with color frequently deliver inferior outcomes for object categories with fluctuating significance of color as well as shape. Our approach uses the color attributes as an unambiguous color representation for object recognition tasks. While, color attributes are dense, computationally efficient, and holds some degree of photometric invariance while keeping discriminative power.

Detection of regular polygons is one of the most significant task with multi-applications in computer vision and robotics. Planar shapes in sketches can be detected using this algorithm. It has been instigated as a working model for shape retrieval and architectural representation from sketches. This algorithm detects all minimal polygons that can be created from a set of line segments in polynomial time and space complexity.Using the latest, complex and efficient algorithms, there is a chance for improvement in the described algorithm. Many different data mining algorithms have to be used so as to make the proposed project more efficient. Additional work can be performed regarding the detection and correction of rounding errors resulting from finite precision calculations.

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