Image Segmentation Techniques to Determine the Time from the Blurred Image of a Wall Clock

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***Abstract* - Edge detection plays a vital role in image analysis. It is a basic tool for image processing and segmentation. In this paper the most widely used edge detection technique is used to estimate the time from the blurred image of a wall clock with trigonometric approach. The blurred and noisy image is subjected to various stages of processing to estimate the time. This procedure is quite simple, moderate and more flexible. The experimental results show a good performance of the proposed model in segmenting blurred image and to estimate the time. All the propositions have been made using the MATLAB Software.**

***Key words* - Image processing, Segmentation, MATLAB 7.0, blurred image**

I. INTRODUCTION

Edge detection is very important in the analysis of images. An image is separated into its component parts of objects by edge detection. The separation level can be calculated depending on the problem being solved. An algorithm for image in edge is normally based on the similarity of image intensity values and discontinuity. The approach of discontinuity to separate an image based on sudden change in intensity and similarity depends on separating an image into regions which are similar with reference to a set of predefined criteria. These discontinuities are due to abrupt changes in pixel intensity which characterizes boundaries of objects in scene. Edges give boundaries between different regions in the image. These boundaries are used to identify objects for segmentation and matching purpose [1]. In this way the choice of edge detection techniques is based on the problem which is taken, a part of image segmentation. The success of image processing in computer vision tasks relies on the perfection of detecting edges, meaningful. In this paper an attempt is made to estimate the time from blurred image of the wall clock by using the commonly used edge detection technique for image segmentation by using MATLAB software. Section 2 introduces the basic concepts of image segmentation and edge detection. Section 3 provides an existing methodology to measure the angles of clocks. Section 4 shows the block diagram of the proposed method. Section 5 provides the theoretical and mathematical background of the experiment with results. Section 6 contains a quick discussion about the work as well as the conclusion.

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II. IMAGE SEGMENTATION AND EDGE DETECTION

Image segmentation is a key step from image processing to image analysis and it occupies an important place. Image segmentation is the process of partitioning a digital image into multiple regions or set of pixels. The image segmentation results are a set of regions that cover the entire image together and a set of contour extracted from the image [3]. Image segmentation is a technique that depends on the problem being considered. The merits of the image segmentation quality and the accuracy of boundary orientation directly affect the subsequent area description and analysis, resulting in the understanding of images [4]. The primary purpose of images segmentation is to obtain target's edge parameters. These parameters are the coordinates of edge pixel.

Segmentation algorithms for images generally based on the two properties of image intensity values: discontinuity and similarity. Edge detection is the most common approach for detecting meaningful discontinuities in intensity values. Such discontinuities are detected by using first and second order derivatives. The first-order derivative of choice in image processing is the gradient. The gradient function f(x,y) is defined as the vector [gx gy]T. The fundamental property of the gradient vector is that it points in the direction of the maximum rate of change of f at coordinates (x,y). The angle at which this maximum rate of change occurs is tan-1[gy/gx]. It is customary to approximate the derivatives by differences of gray-scale values over small neighborhoods in an image [5].

An edge operator is a neighborhood operation which determines the extent to which each pixels neighborhood can be partitioned by a simple are passing through the where pixels in the neighborhood. Edge detection operators are often implemental with convolution masks and discrete approximations to different operators. These operators may return magnitude and direction information, some magnitude only [6].

First order derivatives are approximated digitally by differences. The Sobel edge detector computes the gradient by using the discrete differences between rows and columns of a 3x3 neighborhood, where the center pixel in each row or column is weighted by 2 to provide smoothing.

2.1 Sobel Edge Detection

The Sobel (1970) proposed a method of edge detection for image segmentation find edges using the Sobel approximation to the derivative. The Sobel detector, convolve the input image with their respective convolution mask. Threshold values are used to detect edges. The output edge detection image is very mush sensitive to the threshold. The Sobel operator is on the simple and best operator. It utilizes a 3x3 mask. The goal of edge detection is to identify the points where there is an apparent change in brightness. Edges in an image often indicate critical features or major changes. The origin of the weight masks is observe and they were probably derived empirically in the first plane, however it is clear that they apply more weight to the centre pixel finite difference than the horizontally (or) vertically adjacent ones(15). The Sobel masks used to compute the gradient in the x and y directions respectively, with respect to the center point of the neighborhood,

$$\delta y = \begin{bmatrix} -1 & 0 & 1 \\ -2 & 0 & 2 \\ -1 & 0 & 1 \end{bmatrix} \quad \text{and} \quad \delta x = \begin{bmatrix} 1 & 2 & 1 \\ 0 & 0 & 0 \\ -1 & -2 & -1 \end{bmatrix}$$

The article uses Sobel operator to do edge detection on the current frame. When using multi image difference for

detection, the edge of result image is usually not connective which can influence the target region segmentation. In order to make target and background better, the disconnected edge needs to be repaired to a close margin [8]. The reference [9] proposed an edge connection method by direction restriction which considered edge direction. Reference [10] proposed method which only considered distance relationship. The method in reference [11] considered edge direction as well as distance relationship. According to this method, in this paper we can take into account both edge distance and edge direction by adjusting parameters. That means, the connecting distance can be accurately defined by changing the angle.

III. EXISTING METHODOLOGY

At present the time of blurred image is calculated by observing and immediately determining. Which are the operator's marks pointing over the boundary manually? The marked points are approximated and the blurred time in the wall clock. The accuracy of this method depends on the manual calculation. There is no method to find the time of a blurred image. For this the clock is treated as having 360^0. In this method is a low manpower, low cost effective, simple and accurate methodology for detection time from blurred image.

One complete rotation (Counter-clockwise) = 360^0. Here 1 degree (1^0) = 60 Minutes and 1 Minutes ($1^!$)= 60 seconds ($60^{!!}$). The positive angel θ is XOA (counter-clockwise rotation) and the negative angle θ is XOA^1 (clockwise rotation) [12].

IV. EXPERIMENT

The experiments were carried out using MATLAB, and estimated the time with the blurred images. The steps involved in pre-processing the blurred images which are as follows:

4.1 Low Pass Filter

The low pass filter is method used for finding out the slowly varying components of an image. So when we employ low-pass filter to process an image it allows only slowly varying image details and attenuate heavily the details corresponding to edges and sharp transitions and results in a blurred image [13]. The low pass filter seeks to remove unwanted noise from an image while at the same time preserving all the essential details that an observer would wish to see in the original image. Low pass filter is applied to the input image in order to allow spatial frequencies in the Ideal image to pass through while attenuating the high spatial frequencies of the noise components [14].The filtering operation can be implemented by convolving the entire image with a simple 5X5 mask. The application of the low pass filter of size was done by replacing each pixel value by the average or mean of its immediate neighbors. This technique reduces image noise but at the expense of significant image blur as it tends to smear the edges of objects in the image [15]. Thresholding is one of the necessary techniques used for image segmentation. From the point of view of segmentation threshold is a method of producing regions of uniformity with an image based on some threshold criterion [16].

4.2 Correlation Based Hour Hand And Minute Hand

Correlation-based method deal with hour hand and minute hand. The time and angle of degree are shown in the Figure.1. The minute hand indicates a certain degree that the minute is determined as,

$$T_m = (\theta^0 X 0.16667),$$ where θ is an Angle of the Clock.

Also the hour hand is indicates a particular degree that the time is calculated as,

$$T_h = \frac{\theta^0}{30}.$$

It is observed that the movement of the hour hand is based on the movement of the minute hand. The relationship between the both hands is denoted as f(x) = E [aa^{-t}] and g(x) = E [bb^{-t}]. The ijth element of f(x) is given by E[f_{ij}], which is the correlation

between i^{th} and j^{th} element of f. Similarly ij^{th} elements of g(x) given by $E[g_{ij}]$.

Figure.1. Correlation based Time and Angle

4.3 Time Calculation Using The Angle Between Two Hands

The edge detection image can then be effectively used to find the time of the blurred wall clock. The angle of degree between the hour hand and minute hand can be correlated into a real time value by multiplying it with a desirable conversion factor. The conversion factor can be estimated by comparing the angle of degree of hours and minute hand. It is likely that the present as well as the future generations may use a single hand- wall clock. In such a type of wall clock time is estimated by using the correlation of the hour and minute hand. Thus, by the careful calculation of the blurred wall clock, the estimated time is obtained using the available techniques. This technique provides the accurate time. This system is initially calibrated, and performs all the operations automatically for the forthcoming samples. Similarly values are then obtained at various points on the clock and the cumulative average of this angle of wall clock, the cumulative average is calculated from the wall clock and thus the exact time is fixed in the blurred wall clock. The experimental results conducted in several wall clock images and some of them are shown in figure 2. The estimated time of the blurred wall clock images are explained.

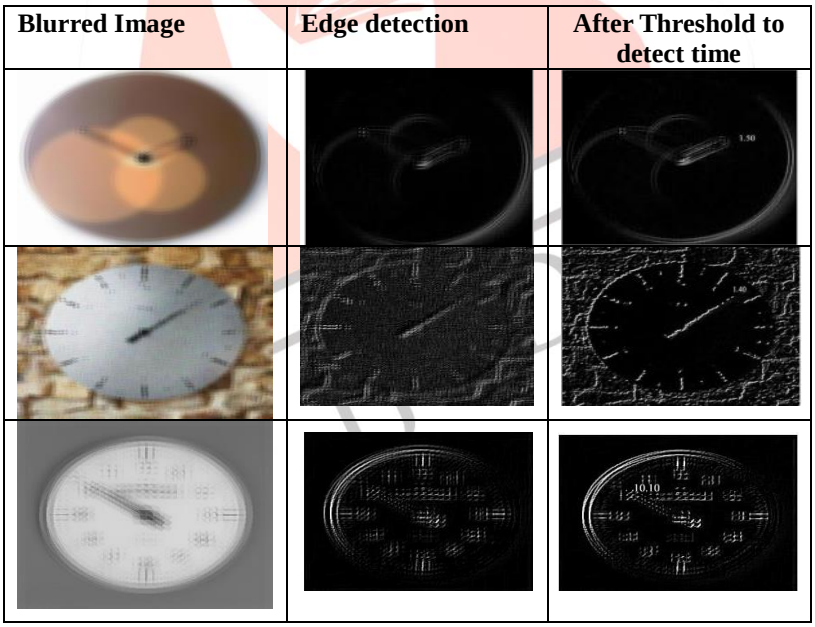

Figure.2.Time measured in different clocks using MATLAB

It is observed that the proposed algorithm performs well by considering the criterions, true time detected, type of images/blurred image based on Single Hand and Two Hand wall clocks. All the matching file formats of the JPG image and sobel corner detection.

V. CONCLUSION

Thus the proposed edge based image segmentation is novel and highly reliable in terms of accuracy of the results. Compared to manually calculating time procedure it is better to determine the time calculation which are obtained from several points from the wall clock with blurred images. Also this technique is fully automatic and reduces the possibilities of human

errors. Also it helps in reducing the computational time and thereby improving the overall efficiency of the system.

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