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EDGE DETECTION OF AN IMAGES BY INCREASING WPR USING IMPROVISED CANNY EDGE DETECTOR

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ABSTRACT

Object recognition means finding the spot of the object and recognize it. Basically this techniques used for the object detection are feature matching algorithm, pattern comparison and boundary detection. The feature matching algorithms are used for finding the best solution matching object in the knowledge base and implement the reconstruction of the recognized object. Edge detection is a field which has intrigued programmers since early 1970s. Since then, a good number of edge detection techniques have come up but the technique used by Canny is very widely used. However, it has been observed that the results are not that efficient while dealing with alpha-numeric sections or geometrical figures or fine grain region in an image. To mitigate these limitations, an improvised edge detection technique is proposed. The technique uses a Laplacian of Gaussian gradient with a new approach towards the thresholding section.

KEYWORDS: Edge detection, Face representation, , Image processing, Noise reduction

OVERVIEW

An edge is normally defined as the boundary or contour at which a considerable change occurs in some physical aspect of the image. Changes in physical aspect clear themselves in a variety of ways such as changes in intensity, colour and texture. The variations in physical aspect can be caused by discontinuities in strength, surface orientation, changes in texture (material properties), variations in illumination etc. Edge detection is the process of characterizing the power changes in an image in terms of the physical processes that have originated them. An edge detection system is dependent on a variety of factors like the application or context in which it is used, noise in the source image and level of edge details required.

EDGE DETECTION ALGORITHMS

Edge detection and extraction is an active area of research where several algorithms are being developed to suit different purposes and applications. It is a proven fact that not all edge detection algorithms are suitable for all types of applications . Still there are popular edge detection algorithms that form a broad basis for developing algorithms suitable for specific purposes. In our thesis we consider the following five popular algorithms.

- The traditional Sobel's edge detector
- Robert's edge detector
- Prewitt's edge detector
- Laplacian of Gaussian (LoG) detector which uses zero crossings
- The modern standard: Canny's edge detector
- Pb edge detector

CANNY'S EDGE DETECTOR

Canny's edge detector is one of the most popular edge detection algorithms. Canny planned a list of criteria for enhanced better edge detection method. The first one is criterion is low error rate. That is authentic edges should not be missed and spurious edges not chosen. The second criterion is good localization. In other words, the distance between the edge pixels originate by the detector and the actual edge should be minimal. A third criterion is to have only one reaction to a single edge point. This was cited because the first two are not substantial enough to completely remove the possibility of multiple responses to an edge. Based on these criteria, the canny's edge detector was planned. The first step in the process is smoothing the image using a Gaussian filter. then the image Gradient is computed with multiple first derivative operators in different directions, to highlight regions with high

spatial derivatives. Then the algorithm tracks beside these regions and suppresses any pixel that is not at the highest (non-highest suppression).

Canny's algorithm depends on the number of parameters such as standard deviation for the Gaussian filter and lower and upper threshold values *T*1 and *T*2. The value of controls the size of the Gaussian filters. Larger the scale of the Gaussian filter, lesser the precision of localization of the edges. Whereas smaller values of imply a smaller Gaussian filter which confines the amount of blurring, maintaining finer edges in the image. Canny's edge detection algorithm is computationally more costly as compared to Sobel's, Prewitt's and Robert's operators.

PB EDGE DETECTOR

Berkeley's Pb edge detector or boundary detector is one of the recent and most successful edge detection technique. Pb edge detector computes the posterior probability of an edge point based on the local image brightness, colour and texture. It computes the gradient signal from four different channels of the image signal: brightness (using odd and even symmetric filters), colour A and B (CIE lab colour space) and texture channel. For texture channel, the image signal is convolved with a filter bank containing both even and odd filters at multiple orientations as well as a radially symmetric centre-surround filter, associating a vector of filter responses to every pixel. These vectors are clustered using k-means and each pixel is assigned to one the cluster centres, or Textons. Texture dissimilarities or channel gradient is then computed by comparing the histograms of Textons in the two disc halves at each pixel location. To detect fine as well as coarse structures, gradients of all four channels are computed at multiple scales (mPb) and then combined. After combining, maximum response from 8 different orientations is considered to get a measure of boundary strength at each pixel. In the next step, spectral clustering is performed. As an input to spectral clustering a sparse affinity matrix is constructed using the intervening contour cue, using the maximum value of mPb along a line connecting two pixels. Then eigen vectors are computed by solving for the globalized sparse affinity matrix. Then these eigen vectors are convolved with Gaussian directional derivative filters to obtain oriented gradient signals. Then the information from these different eigen vectors are combined to provide the "spectral" component of the boundary detector (sPb).

COMPUTING GRADIENT MAGNITUDE FROM DIRECTIONAL DERIVATIVES

So far we computed the gradients along horizontal and vertical directions as given by *fx* (*n*1*; n*2) and *fy* (*n*1*; n*2). These gradients are directional edge detector functions as they can be used to identify edges lying along horizontal and vertical directions respectively. But in facial images, edges are not strictly aligned along horizontal or vertical directions. In fact most of the edge lines in facial images are not even strainght lines instead they are curved along the various facial boundaries. In practice it is not feasible to compute directional derivatives along all possible directions. Hence we need to formulate a non-directional edge detector function which helps in capturing these boundaries. In the proposed method we use the root mean squared value of the directional derivatives to formulate the non-directional edge detector function. The root mean squared value provides a good estimation of the edges which are not strictly aligned to horizontal or vertical directions. The root mean squared value is computed from horizontal and vertical directional derivatives as shown in equation

$$|\nabla f\,(n_1, n_2)| = \sqrt{(f_x\,(n_1, n_2))^2 + (f_y\,(n_1, n_2))^2}$$

where $|\nabla f\,(n1; n2)|$ represents the gradient magnitude matrix which is non-directional.

Genuine edge points can be extracted based on the gradient variations or local maxima in the gradient magnitude matrix $|\nabla f\,(n1; n2)|$. A point is identified as local maxima if its gradient value is greater than both its previous and next point either along the rows or the columns of the gradient matrix. Points having local maxima along the rows correspond to vertical edge points whereas the points having local maxima along columns correspond to horizontal edge points. But all local maxima points need not correspond to a genuine edge point. There might be some noise pixels. Hence we need to apply suitable thresholding and thinning techniques to reduce the noise and filter spurious edge points.

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RESULTS

To Simulate edge detection of an image by increasing WPR using improvised canny edge detector matlab test bench is created:-

LENNA is the standard experimental image of size 512x512 pixels. The colour image is taken as an input image for testing the proposed algorithm.

Figure: .1: Lenna Input Image For Testing the Proposed Algorithm

LENNA image after conversion from "RGB" TO "GRAY". The image now in gray scale that is black and White image.

Figure: 2: Image after Conversion from "RGB" To "GRAY"

The edges are detected of LENNA image after filtering the image using different filters.The CANNY operator is used to detect the edge of the given image. This operator provides the best edge as compared to the others operator.

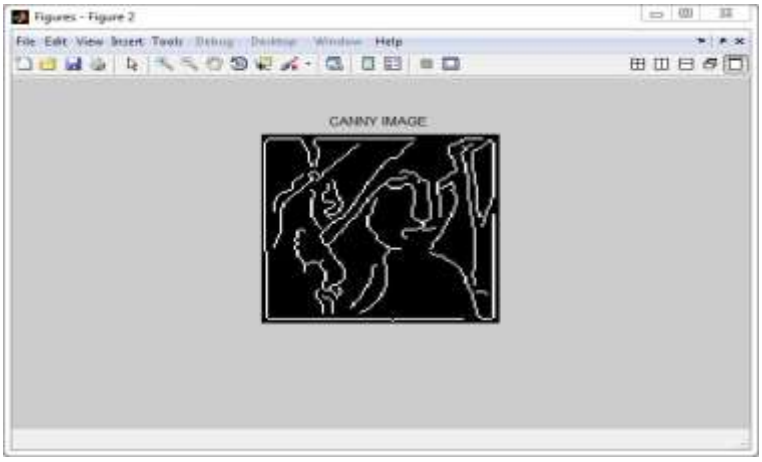

Figure: 3: Edge Detection Using "Canny" Operator

CONCLUSION

In the presented analysis two different types of filters are used to eliminate the noise, these are GAUSSIAN and

LAPLACE OF GAUSSIAN (LOG) filters with all different types of operators (CANNY, LOG, SOBEL, PREWITT and ROBERTS's) to extract the edge of a given images with SDK-CANNY operator the value of weight pixel ratio (WPR) is greater than the CANNY operator.

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