DISTRIBUTING IMAGE FOR IMAGE EDGE DETECTION USING THRESHOLD VALUE AND LOCAL GRADIENT

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***Abstract*— This paper explain spitting the image in number of blocks for detecting boundaries more precisely using distributed Canny edge detection algorithm for high turnout application. In comparison to the conventional Canny edge detection algorithm which makes use of the global image gradient histogram to determine the threshold for edge sensing, the planned algorithm adaptively calculate the edge detection threshold based on the local distribution of the gradients in the thoughtful image block. The effectiveness of the distributed Canny in detecting psycho-visually important edges is validated using a visual acuteness metric. The proposed distributed canny edge detection algorithm has the capacity to scale up the end product adaptively, based on the number of calculated engines. The algorithm succeeds about 72 times speed up for a 16-core architecture, without any alteration in performance. Moreover, the internal memory requirements are significantly reduced especially for smaller block sizes.**

Keywords—Canny Edge detection, Spitting process, Non-uniform quantization.

I. INTRODUCTION

EDGE detection is the most common pre-processing step in many image processing algorithms such as image enhancement, image segmentation, tracking and image/video coding. Among the existing edge detection algorithms, the Canny edge detector has remained a standard for many years and has best performance. A canny edge algorithm is widely used due to the calculation of high and low threshold values from input images. The canny edge algorithm gets the high and low threshold values from all the pixels of input image. Canny algorithms have implemented on a wide list of hardware platform. Edges represent the significant local changes in the intensity of an image. Image boundaries determining minimizes the amount of data and differentiating futile information, while saving the original image.

A distributed canny edge detection algorithm is used which requires less memory, minimizes latency and maximize precision of image with no loss in the performance of the boundaries detection, when compared to that of the original Canny algorithm Edge detection is the process of identifying and locating the discontinuities present in an image. The discontinuities are the immediate changes in pixel intensity which characterize edges of objects in a image. Determining boundaries is one of the most important tasks in image analysis, and there are many algorithms for enhancing and detecting the edges for more precise output. For indicating the overlapping boundary of the object edges are defined which are boundary between object and background. Edge detection is a very important area in the field of Computer Vision. Edges define the boundaries between the regions in an image, which helps with segmentation and object recognition. An edge detector accepts a digital image as input and produces an edge map as output. The edge map of some detectors includes the information regarding the position and strength of the edges and their orientation. The quality of edge detection is highly dependent on lighting conditions, the presence of objects with the similar intensities, density of edges in the image, and noise. [6]Hysteresis threshold value and local gradient help to be in competition.if the threshold dnt have correct value then it may loss in some edges.

II.LITERATURE SURVEY

A. *Background*

With Canny's mathematical formulation of these criteria, Canny's Edge Detector is optimal for a certain class of edges (known as step edges). A C# implementation of the algorithm is presented here.

Edges characterize boundaries and are therefore a problem of fundamental importance in image processing. Edges in images are areas with strong intensity contrasts – a jump in intensity from one pixel to the next. Edge detecting an image significantly reduces the amount of data and filters out useless information, while preserving the important structural properties in an image. This was also stated in my Sobel and Laplace edge detection tutorial, but I just wanted reemphasize the point of why you would want to detect edges.

Ability to detect the boundaries more precisely canny edge algorithm is used. Problem of canny edge algorithm is its not affordable and not real time implemented. The canny edge operates on whole image at a time so if we want any other algorithm then we have to wait for previous completion.

As per requirement of improving the previous problem distributed canny edge works on block level. Which results in 1)increasing precise throughput. 2)cost minimize on least memory.3)we can pipeline the images.

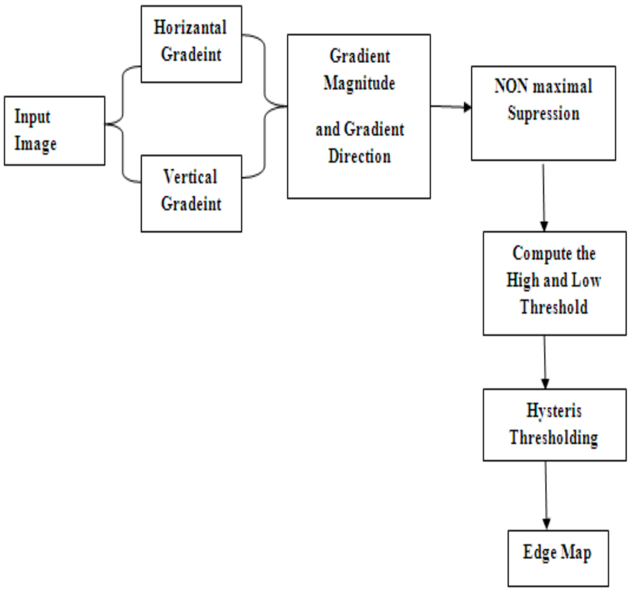

Fig 1:Canny edge detection.[1]

The Canny algorithm shown in above fig. It consists of the following steps sequentially:[5]

1. Low pass filtering the image with a Gaussian mask
2. Computing horizontal and vertical gradients at each pixel Location
3. Computing the gradient magnitude at each pixel location
4. computing a higher and lower threshold based on the histogram of the gradients of the entire image
5. Suppressing non-maximal strong edges
6. Performing hysteresis thresholding for connected weak edges
7. Applying morphological thinning on the resulting edge Map.

B. ***Literature Extraction***

The review from different researchers and surveys clarifies that single approach is not much successful for Canny edge detection Cany edge works on frame level which requires large internal memory. The Canny algorithm calculates the higher and lower thresholds foboundary detection. As per requirement of improving the previous problem distributed canny edge works on block level

In proposed algorithm for spitting image for image segmentation and boundaries detection by using threshold value and local gradients detects boundaries more precisely..In the previous algorithm the smoothing function is first perform on image then noise is reduced.Then calculate gradient values of image.Then by using algorithm moderation has done and remaining pixels are reduced.Hysteresis is used to check magnitude it generates two values.if magnitude>high threshold=edge is made

To summarize the previous work the following three criteria are important.
criteria I-Low Error rate: It is important to detect all boundaries present in images and avoid false edge detection.

criteria II-Edge points are well localized: The boundary values as found by the algorithm and the present edge distance is to be at a minimum.

criteria III-To eliminate multiple boundary response above two criteria are not enough.
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Boundaries detection is a very important first step in many algorithms used for segmentation, tracking and image/video coding.

III. PROBLEM IDENTIFICATION

A. *PROBLEM DEFINITION*

The literature review includes background and extraction which describes some problems regarding detection of edges.Edge detection always remains difficult and challenging task. As the review shows that selection of techniques are models are responsible for the inaccuracy , not affordable and not real time implemented in the detection of edges.

B. *SOLUTION DOMAIN*

In order to improve the performance of the edge detection at the block level and achieve the same performance as the original frame-based Canny edge detector when this latter one is applied to the entire image, a distributed Canny edge detection algorithm is proposed. A diagram of the proposed algorithm is shown in Fig. 1. In the proposed distributed version of the Canny algorithm, the input image is divided into $m \times m$ overlapping blocks and the blocks are processed independent of each other. For an $L \times L$ gradient mask, the m × m overlapping blocks are obtained by first dividing the input image into n × n non-overlapping blocks and then extending each block by (L + 1)/2 pixels along the left, right, top, and bottom boundaries, respectively. This results in m × m overlapping blocks, with m = n + L + 1. The non-overlapping n ×n blocks need to be extended in order to prevent edge artifacts and loss of edges at block boundaries while computing the gradients and due to the fact that the NMS operation at boundary pixels requires the gradient values of the neighboring pixels of the considered boundary pixels in a block.

Canny developed an approach to derive an optimal edge detector to deal with step edges corrupted by a white Gaussian noise.[4] The original Canny algorithm. Consists of the following steps:1) Calculating the horizontal gradient *Gx* and vertical gradient *Gy* at each pixel location by convolving with gradient masks. 2) Computing the gradient magnitude *G* and direction *θG* at each pixel location.3) Applying Non-Maximal Suppression (NMS) to thin edges. This step involves computing the gradient direction at each pixel. If the pixel’s gradient direction is one of 8 possible main directions (0°, 45°, 90°, 135°, 180°, 225°, 270°, 315°, the gradient magnitude of this pixel is compared with two of its immediate neighbors along the gradient direction and the gradient magnitude is set to zero if it does not correspond to a local maximum.

For the gradient directions that do not coincide with one of the 8 possible main directions, an interpolation is done to compute the neighboring gradients. 4) Computing high and low thresholds based on the histogram of the gradient magnitude for the entire image

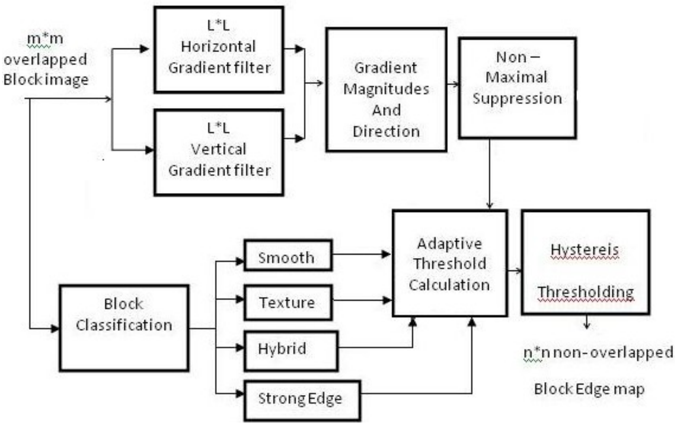

Fig 2. Distributed canny edge algorithm

Fig 3: Original 512×512 House image[1]

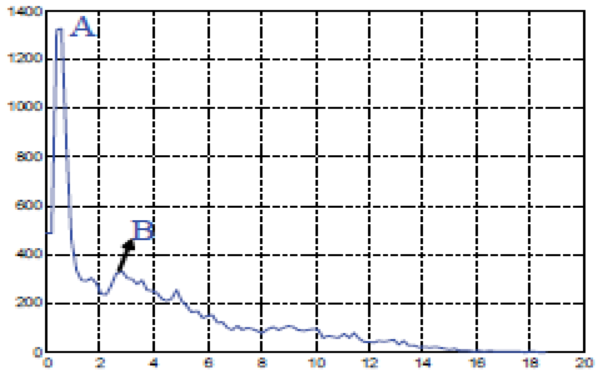

Fig 4: Histogram of the gradient magnitude[1]

The Discrete Cosine Transform (DCT)[2] method is to separate the image into parts of differing importance. It transforms image from the spatial domain to the frequency domain. The 2-D DCT block calculates the two dimensional discrete cosine transform of the input signal. This involves simply computing values for a Convolution mask (8 x 8 windows) that get applied (sum values x pixel the window overlap with image apply window across all rows/columns of image). To obtain the output array of DCT coefficients, apply 1D DCT (vertically) columns and apply 1D DCT (horizontally) to resultant vertical DCT above or alternately horizontal to vertical .

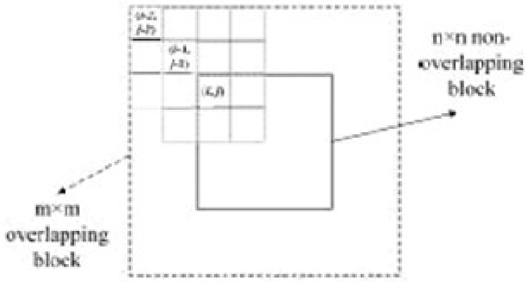

Fig 5:overalapping and non –overlapping blocks

IV.CONCLUSION

The original Canny algorithm relies on frame-level statistics to predict the high and low thresholds and thus has latency proportional to the frame size. In order to reduce the large latency and meet real-time requirements, we presented a novel distributed Canny edge detection algorithm which has the ability to compute edges of multiple blocks at the same time. To support this, an adaptive threshold selection method is proposed that predicts the high and low thresholds of the entire image while only processing the pixels of an individual block.

This results in three benefits:

1) a significant reduction in the latency;
2) Better edge detection performance;
3) The possibility of pipe lining

The Canny edge detector with other block-based image codecs. In addition, a low complexity non uniform quantized histogram calculation method is proposed to compute the block hysteresis thresholds.

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