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# An Improved Novel Algorithm for Memory Management of an Advanced Line Buffer Based Image Processing Pipeline

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**ABSTRACT*:*** The performance of the image is mainly based on the memory consumed, time and the quality of the image. High flexibility can be achieved by using the software implementation and by using the various image processing algorithms. In this paper the memory usage is considerably reduced by implementing certain rules and by reducing the noise in the image. By using the low memory environments the insertions of the algorithms will be easy. In the previous implementation the memory usage will be high compared to our present work .In the previous the filtering techniques and the image enhancement was not properly specified. So we are moving to a advanced techniques for removing the noise using median filter and image enhancement using the Otsu's method. The implemented framework will increase the performance using various pipeline configurations.

**KEYWORDS —** Pipeline, Otsu's Method ,Median Filter, Image Enhancement

## I. INTRODUCTION

Mechanism of developing a 2D picture by computer is referred to as image processing. Image is nothing but sequence of the variables. Brightness of the image at the real position can be obtained by amplitude a at the coordinate position at (x,y).Ex a(x,y) where a is the amplitude. Image processing manipulation can be done by storing image in memory system in sequence of image points in row or column of the image array. Images should be available in digital form .Digitization can be done with the help of sampling and quantization process where each pixel is quantized to fine number of bits. For displaying the image the signal should be converted in analog form and scanning can be done. In camera image intensity of the picture can be measured by the amount of light that is obtained at the time. Image quality also measured from the deviation that appears from the above mode. Images are manually made from physical model of the object (ie) from natural scenes which is constructed that inturn refers to sharpening of the message content to make a graphic display. By this process image information will not increase the content in the data. It includes the following process noise reduction, edge grasping and interpolation .Noise usually quantified by the percentage of pixels which are corrupted. Corrupted pixels are either set to the maximum value or have single bits. There are several ways that noise can be introduced. Image reconstruction is relevant to any device containing a digital camera. In order to have acceptable image quality, raw image data are processed with various image processing algorithms. The widely used image processing algorithms include noise filtering and several color correction operations. The combination of algorithms is organized into an image reconstruction pipeline.

## II. RELATED WORK

Digital image has now become more common in all industry, so it is essential to reduce the cost and thereby maintaining the color quality and resolution of the image. Before most of the image processing can be conducted, dead pixel values must be removed. Traditionally, dead pixel detection and correction is achieved by storing the locations of the dead pixels during sensor manufacturing test. The ordering as well as the algorithm adopted in each stage for processing a color image is usually called color image processing pipeline (IPP).Although many algorithms have been proposed to address the issues of color image processing, covering the stages from raw image data to the final JPEG file

A good IPP should consider the ordering as well as the algorithms for color reproduction, tone reproduction, noise filtering, and edge enhancement. The aim of AWB is to guess the illumination under which the image is taken and compensate the color shift affected by the illuminate. The AWB problem is usually solved by adjusting the gains of the three primary colors *R*, *G*, or *B* of the image sensors to make a white object to appear as white under different illuminants.

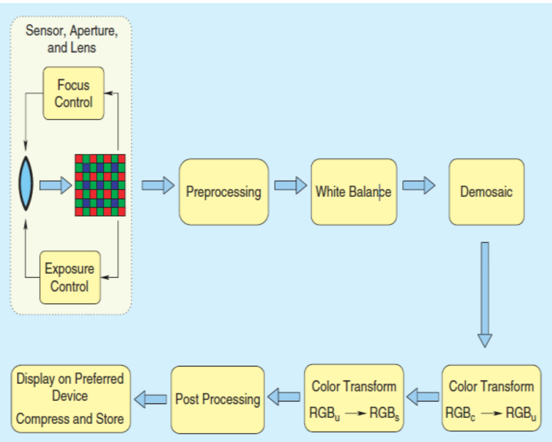


Fig 1.Image processing in DSC

In image processing the most essential operation is removing the noise that is obtained in the image. So it is mandatory to enhance the sharpness by implementing the enhancement algorithm. The issues of noise filtering and edge enhancement include the following items: (a) some false edges resulted from random noise are produced by edge detectors. This is because edge points could be estimated by evaluating the maximum gradient components. Without prefiltering, many random noise may be judged as edge points by edge detectors.(b)Bilateral filter considers both geometric closeness and photometric similarity with domain and range filtering, respectively. However, it is still possible for the bilateral filter to blur some high resolution image details if a global view of edge locations is not available. (c) The edge detector for guiding bilateral noise filter provides local high frequency information, but the false edges must be identified and removed. Otherwise, the noise cannot be smoothed out in the bilateral filter stage. With the advances in integrated circuit technology, the computation power is not always the major considerations for the design of image pipeline.

Although most of edges can be preserved by the modified bilateral filter, the optical lens imperfections will cause the image to be blurred, especially at the four corners. Hence it is necessary to enhance the edges in the image processing pipeline. Several noise filters are adopted to deal with different classes of noise and different color spaces are used to handle the problems of noise filtering and edge enhancement.Although the computation complexity of the proposed approach is higher than traditional bilateral filter.

A desirable property of any color digital imaging system is to render real world scenes on electronic as close as possible to what human beings can perceive. High dynamic range (HPR) image display has been a very challenging issue in the pursuit of this goal. The dynamic range of real-lifescenes spans up to 106 :1 whereas the human vision system can discriminate a dynamic range of about 104 : 1. On the other hand, electronic devices can only handle a much narrower range: the dynamic range that a digital camera can capture does not exceed 2N : 1 (Nbeing the bit depth of the camera), and an 8-bit display has a dynamic range lower than 100:1

Digital cameras can also function as digital video cameras with few additional hardware components, especially when they have programmable processing units to implement video coded algorithms. Traditional video cameras will be the benchmark for this functionality and will drive video signal processing requirements such as real-time auto white balance, exposure and focus control, and vibration blur compensation. The imaging pipeline is implemented as a synthesizable image sensor companion chip. Therefore, it has to meet stringent real-time performance requirements and operate within a low power budget .But in our paper we are focusing on the software implementation of the work.

## III.SYSTEM DESIGN

The System architecture diagram for our proposed diagram will be discussed below:

*A. Median Filtering:*

A straight forward process is done in median filter which is useful in reducing impulsive noise and maintaining edges in image filter. These noises generally occur due to error that arises in communication channel. In this filter a window will drive along the image and the value of the pixels in the window is same as the output intensity of the pixel that is performed.

Filter should be designed in such a way that each pixel in image looks exactly same as adjacent pixel. Median value is calculation is done by sorting the pixel value from the neighbouring pixels in an numerical order and replace the pixel that is considered by the value obtained in that median.

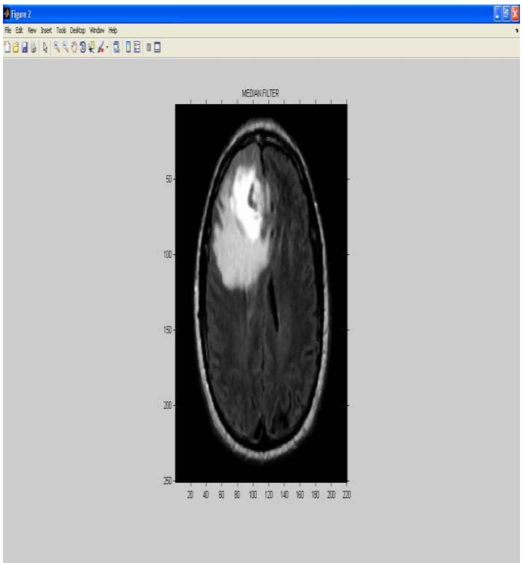

Fig 2.image after median filtering

*B.OTSU'S Method:*

**Otsu's method** is done to cluster threshold images and to reduce gray level image to binary. It assumes the image threshold class has two pixels so that optimum threshold between the classes in combined spread should be minimum.

This extension is referred to as multi Ostu method. By this method we will search for the threshold that optimizes the difference between them which is stated as weighted sum of two classes..

$$\sigma_w^2(t) = \omega_t(t)\,\sigma_1^2(t) + \omega_2(t)\,\sigma_2^2(t) \qquad (1)$$

Each tile's contrast is enhanced, so that the histogram of the output region approximately matches the histogram specified by the 'Distribution' parameter. The neighboring tiles are then combined using bilinear interpolation to eliminate artificially induced boundaries. The contrast, especially in homogeneous areas, can be limited to avoid amplifying any noise that might be present in the images

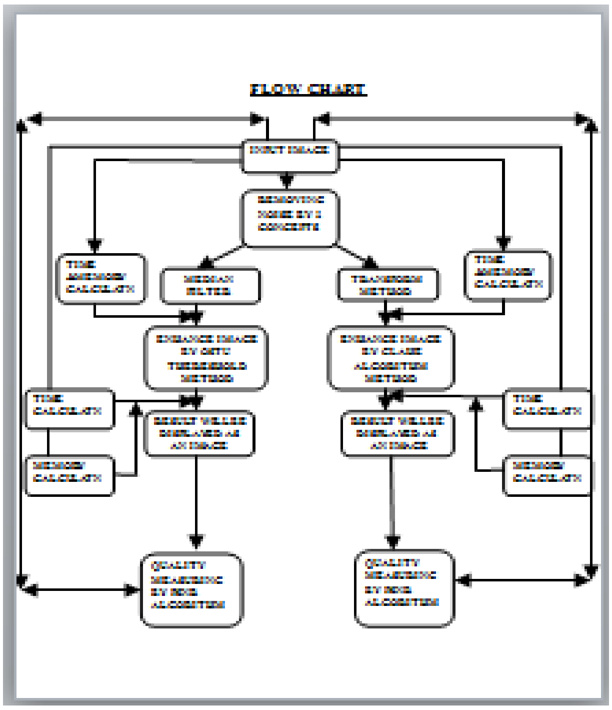


Fig 3.System architecture

*D. CLAHE Algorithm:*

CLAHE algorithm has proven to be most successful algorithm for increase of low contrast images .It will separate the images into determined region and histogram will be applied. This process will even out the grey values and make the hidden image to become more visible.

Main difference of this algorithm from the adaptive histogram equalization is limiting the contrast. It will overcome the standard histogram equalization. The contrast limiting procedure to be applied for each adjacent pixels from which transformation is obtained to prevent the over amplification of noise. This can be done by selecting the field edge in image and process those regions that accompany filed edge.

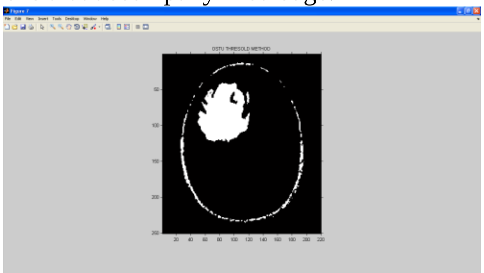

Fig 4.clache algorithm

In this algorithm sharp field edges can be obtained by selective enhancement within the boundaries. Noise can be reduced by maintaining high frequency at the content of image by applying median filter and edge sharpening. This is referred as sequential processing. AHC clip known as adaptive histogram clip it will adjust the clip level and will increase background region of portal images..

*D. PSNR Algorithm*:

It will measure the signal to noise ratio between two ranges in decibels.it will measure the quality between the compressed and original image.If the PSNR Is high then image quality is high.Two process are effectively used to compare image compression. They are Mean Square Error and Peak Signal to noise ratio. Lower the value of MSE then error value will be low.

*E.Time Calculation*:

Time is calculated by TIC-TOC method. It will calculate the time elapsed from the timer by the tic-toc function .It will measure the internal time at the execution and displays the time that had no output Elapsed time = toc returns the elapsed time in a variable.

toc(time val) displays the time elapsed since the tic command corresponding to timerVal.
elapsedTime = toc(timer val) returns the elapsed time since the tic command corresponding to timerVal.

*F.Ways to Reduce the Memory:*

1. Load Only As Much Data as You Need
2. Process Data by Blocks
3. Avoid Creating Temporary Arrays

## IV.DISCUSS AND RESULTS

The implemented SW framework is compared with a traditional image reconstruction pipeline which uses a ping pong buffer scheme. In ping-pong buffering, two full-sized image buffers are used as the input and output buffers. After a single image processing algorithm has been completely executed, the image buffers are swapped, so that the output buffer of the current algorithm is used as the input buffer for the next algorithm and vice versa.

Statistics-dependent algorithms such as tone reproduction assume by default that the in a gestatistics is calculated in between the pipeline. However, in the designed pipeline, image data would enter the next processing stage before the next stage.

The execution times for the individual algorithms were measured by running the algorithms separately, i.e., without any other stages in the pipeline. The execution times for both approaches were calculated as an average of processing the same image ten times.

The performance improvement of our framework is due to the fact that the line buffer memory, being significantly smaller than the full-sized image buffers in the ping-pong pipeline, has better cache locality. During execution, the line buffers stay better in the cache, which decreases the amount of data cache misses. This was verified by analyzing both pipelines with Intel VTune Amplifier XE 2011. According to VTune, the implemented SW framework caused 16.1% less Sdata cache misses than the ping-pong pipeline when the whole pipeline was executed.

## V.CONCLUSION

This paper presented a novel SW framework for the management of a line-buffer-based image reconstruction pipeline. The SW framework reduces memory consumption drastically without any performance compromises. Therefore, the framework is well suited for a wide range of limited devices that need image processing. Easy configurability also guarantees that the SW framework decreases the time spent in the management of the image reconstruction pipeline .At the same time in our paper the memory is reduced by implementing the rules and avoid using temporary memory. It also increases the performance by reducing the time taken to execute the program.In the future work the hardware implementation can be used with lower memory.

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