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Implement of FPGA Using Contrast Enhancement Technique

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ABSTRACT: The Contrast of any image is mainly depending upon the light intensity present in the image. Also this will indirectly related to the quality of an image. This is because is any image having low light intensity then it appears as dark image and a high intensity image appears to be very bright image. In both cases it is difficult to figure out the objects present in that image. So, to make bad quality image to good quality image contrast enhancement techniques are normally used. But the main problem of those techniques is the calculation of threshold value. In this project we propose and implement FPGA architecture for contrast enhancement using adaptive threshold. The performance of the proposed architecture is better than existing techniques in terms of both hardware utilizations and output image accuracy

KEYWORDS: Histogram Equalization, image enhancement, fpga.

I.INTRODUCTION

Now a day's everyone wants to capture each movements of their life, the perfect pictures are captured with the help of camera. Usually we share those on internet for various purposes. Pictures are memories and that are kept as a history in today's internet life and all documents, office letter are scanned and sent through the internet. The evolution of Internet has brought many people to communicate with each other at any place in the world. The Computer has become an important part of human life. We can't imagine our life without computer and internet as all over the world is surrounded and depending on the same.

Let us know how an image is a capture by a camera when light falls on the object it is reflected back. The light consist small packet of energy called a photon. With the help of these photons the image is capture by digital camera, hence an image is produced. Sometimes the captured image is not clear this is due to, not proper climate conditions, lack of brightness while capturing the image. Hence it leads to dim or low contrast. This is a less contrast image.
Image processing is nothing but processing of image such that its quality is batter then original. It includes removing of any kind of noise and irregularity present in it .For this mathematical operations are used. It is the subclass of signal processing. It helps to analysing contains of an image with help of computers.

To take care of quick life human society is incredibly a lot of dependent to gadgets. Gadgets may be able to perform a group of predefined task quicker than traditional person. However to form quicker gadgets, the process unit should be able to method the input file. To make quicker process unit we will use quicker design. However which will not solve the full downside. As a result of the process speed additionally rely upon how briskly information will reach to the actual process unit. The causation of information is directly dependent to the speed of the bus design gift within the style. To design bus design isn't a simple task. As a result of the processor should take information from any input sensors which are able to activate by some incident on that and that we understand that the measure of such incident is way longer than the frequency is employed by the processor. So, once we connect the device to the processor then frequency match happens. To beat that sort of downside frequency conversion i.e. low frequency information to high frequency information at the input of processor and vice-versa within the output aspect of the processor. To make this specific frequency conversion and memory block in necessary. During this case the information is split into little block and store into the memory into one frequency. Once total information frame is hold on into the memory then the date

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may be red with completely different frequency than input. During this means we will build frequency conversion while not modifying or losing any information stream.

II.LITERATURE SURVEY

The basic method to obtain enhance image is histogram equalization (HE) [2]. Before to study the HE let us know about Histogram .it is a alternate form to represent an image. It can be range from '0'to 'L-1'where L is range of pixel valve for gray image it is 256.histogram is a simple plot of number of pixel with brightness value of pixel. It simply counts the pixel intensity value and pixel probability. In HE they are two approaches, global (GHE) and local or Adaptive histogram equalization (AHE).in GHE the histogram of entire image is considered. It is nothing but simple HE obtains of image. Hence it requires more hardware implementation with pore image quality. In AHE include two steps .first step is dividing the entire image into tiles and next step is applying HE for each tiles. Hence the obtain image quality is better than GHE. The AHE method [3] can give better image quality then GHE but main disadvantage of these method is blocking effect and noise amplification .when a same intensity value of pixel fall in two different tiles then AHE may remap them with two different intensity values this is called as Blocking effect hence output image is not smooth. The blocking effect can be seen at boundary of tiles. It also amplifies the noise present in an image. To resolve this problem the overlapping method is used but theses method is more complex. Contrast limited adaptive histogram equalization (CLAHE) [4] is a method use to enhance the local details of an image. Using this method solve noise amplification, the blocking effect of adaptive histogram equalization (AHE). Image is enhanced using two basic techniques they are spatial domain and frequency domain .in spatial method [5] it include point processing .which is nothing nut contrast stretching using linear method and also threshold method. Threshold method used to improve the dim images. The disadvantage of this method is the signal to noise ratio is increased. But this method can be used in medical image processing like CT scan, X-ray etc.

III.PROPOSED ENCHANCEMENT ARCHITECTURE

The proposed architecture for contrast enhancement is shown in the Fig.1. The histogram is calculated from the input image. Depending upon the pattern of histogram the decision making block will decide that the contrast level of the input image i.e. high contrast or low contrast. This will used by linear starching block to stretch the contrast to acceptable label. Then the enhanced image pixel use mapped to a certain boundary by mapping block.

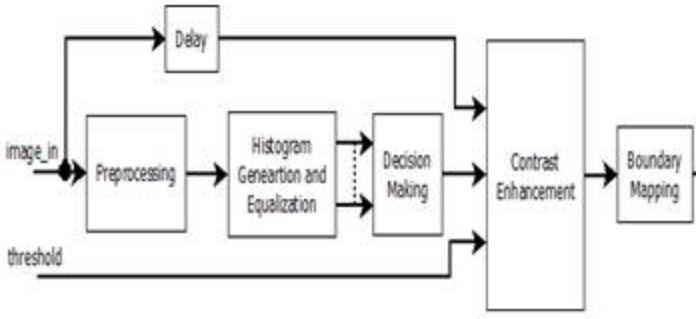

Fig 1 Proposed Model for contrast enhancement

Pre-processing

The input image is resized 255*255 and the colour image is converted by gray to simplify the hardware requirements.

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Histogram Generation and Equalization

The histogram will give the frequency of occurrence of each pixel. This will helps the system to understand the intensity level of the input image. To implement this block we use basic comparator and counter as shown in the Fig.2. In normal method we have to check the histogram of all pixel intensity range (i.e. 0 to 255). But this requires a large amount of hardware resources. To reduce the resource utilizations without affecting the output accuracy we consider only the pixel intensity range from first and last value upto 20 offset. Because most of the bad quality image histogram is higher in this range.

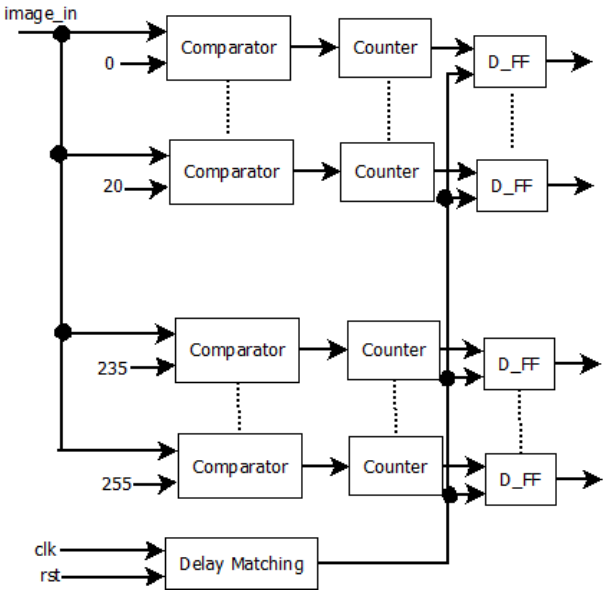

Fig 2 Proposed Histogram generation and equalization

Decision Making

An image consists of range of tones from black on one end to white at another end. The plot of tonal values gives us Histogram of an image. Most tones of an image in shadows then that image is called as “low contrast”. An image with more tones in highlight than it’s a good contrast image.

Depending upon histogram values, decision is made for the contrast of the input image. If the contrast is shifted ‘0’value then the image having low contrast, if the contrast is shifted towards ‘255’ then it having high contrast.

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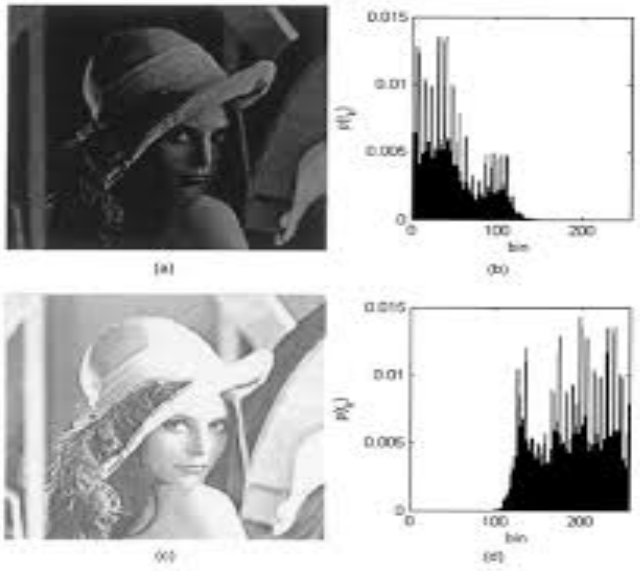

Fig 3 Contrast Decision

Contrast Enhancement

To enhance the contrast of the image we use linear contrast stretching technique [12]. The equation for linear stretching is

Output image pixel = input image pixel ± γ (1)

Where, γ → constant, depend upon the level of enhancement

Boundary Mapping

After linear stretchy there are high possibilities of getting pixel values outside of the considerable range. The boundary mapping block is used to map all pixel values into corresponding boundary for proper display purpose. In the proposed method we consider the gray pixel which can vary from 0 to 255 so the equation for boundary mapping function is

$$\text{Mapped pixel value} = \begin{cases} \text{input pixel} & ; \text{if} \quad 0 > \text{input pixel} < 255 \\ 255 & ; \text{if} \quad \text{input pixel} > 255 \\ 0 & ; \text{if} \quad \text{input pixel} < 0 \end{cases} \quad (2)$$

IV.FPGA IMPLEMENTATION RESULTS

In this chapter we discuss the implementation results on hardware. For this implementation we use ATLYS FPGA Board (xc6slx45-2csg324). The simulink model (software) for proposed architecture is shown in Fig 3.

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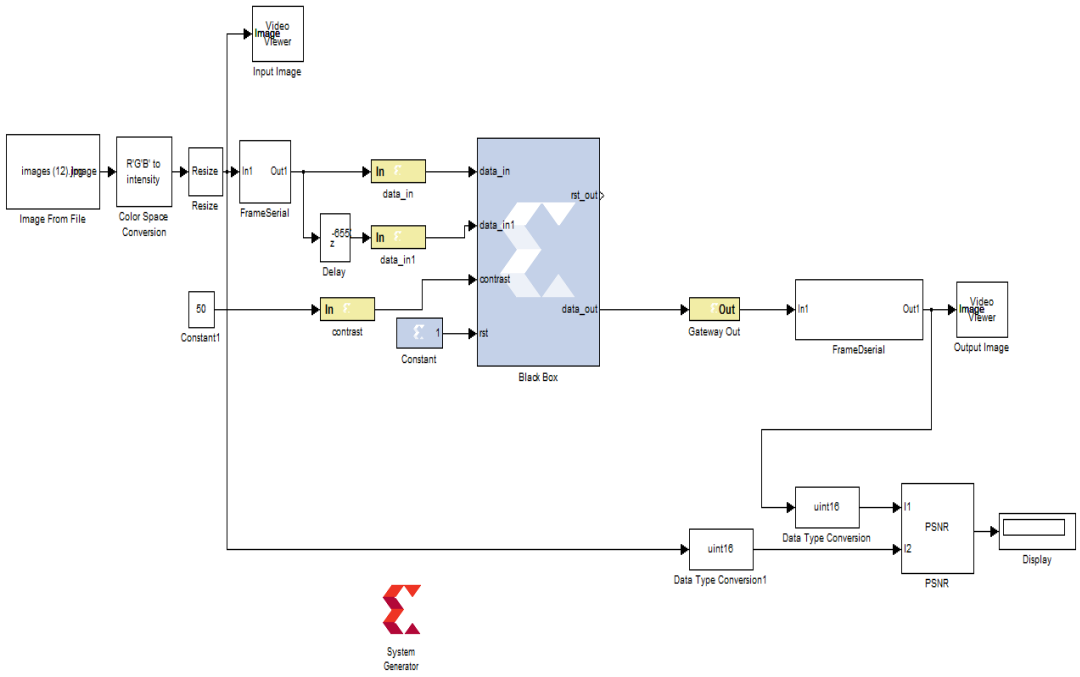

Fig 4 Simulink software for Contrast Enhancement

The simulink model (hardware) for proposed architecture is shown in Fig4 which is generated from the software model.

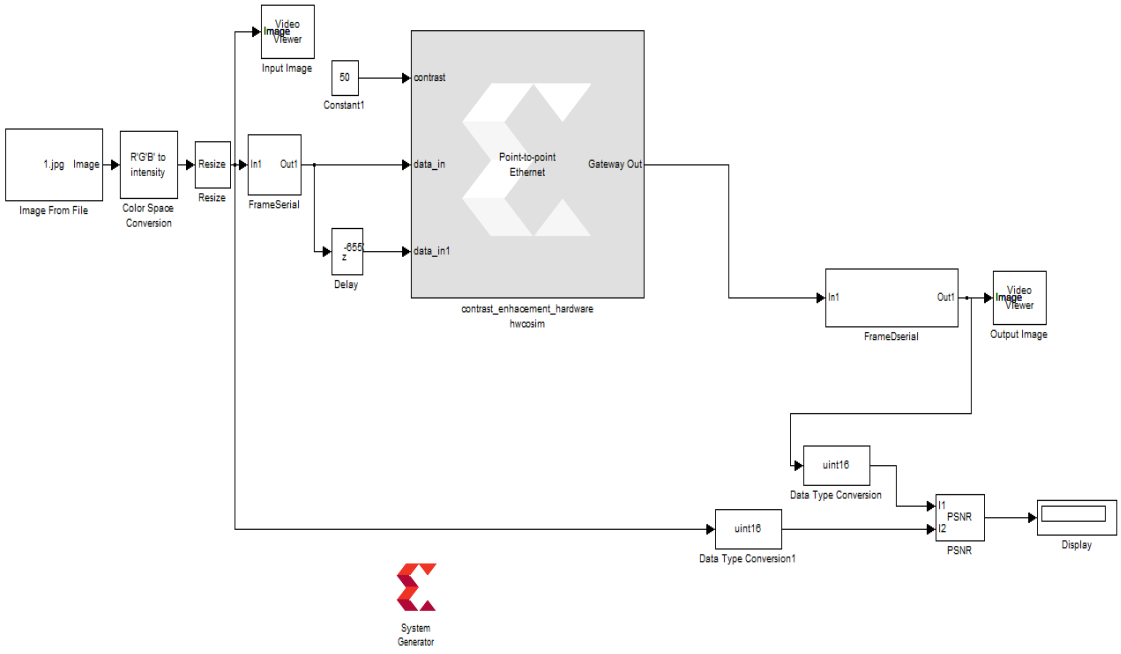

Fig 5 Simulink hardware for Contrast Enhancement

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The images of the proposed architecture is generated at output for contrast enhancement applications is shown in Fig 6.

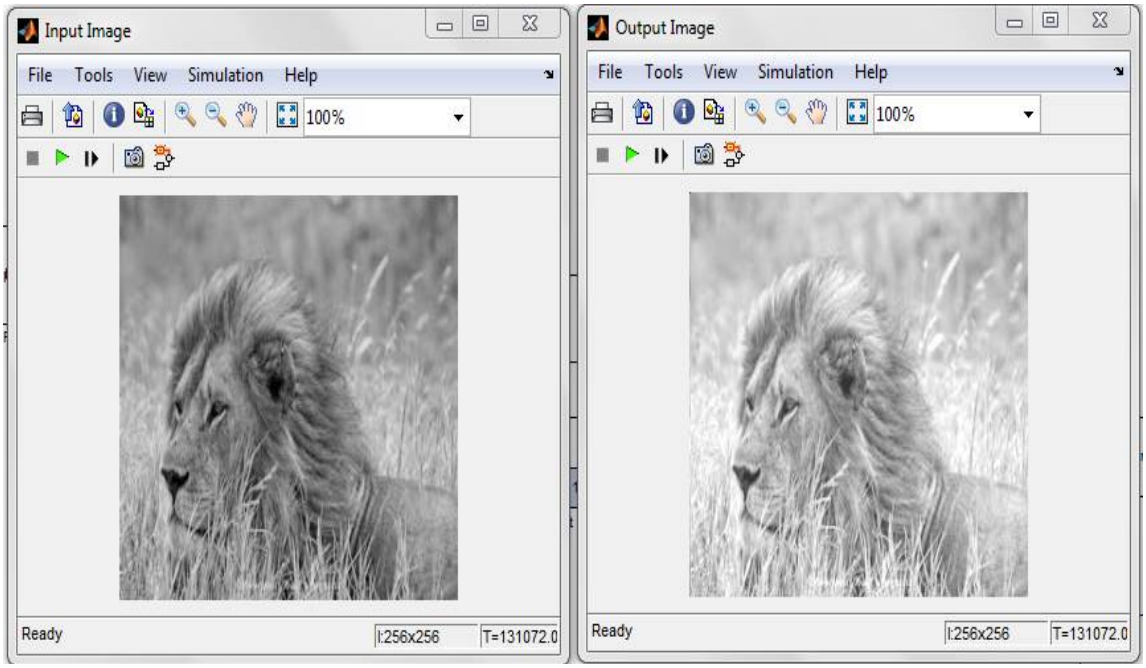

Fig 6 Image input and output

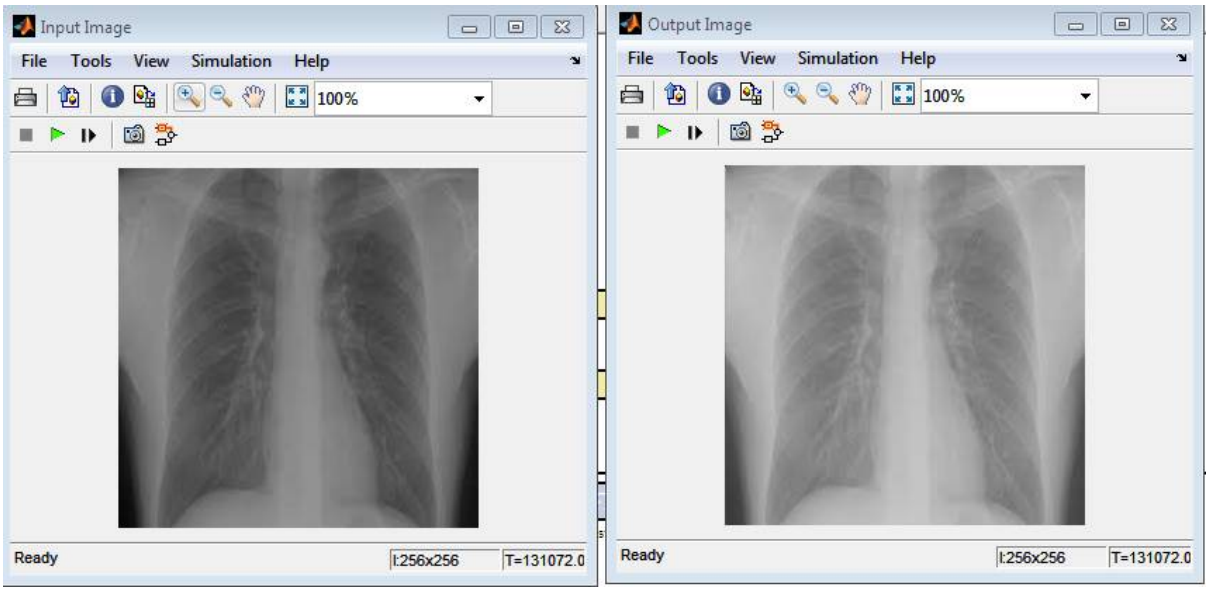

Fig 7 Image input and output

The device utilizations of the proposed architecture is generated by system generator is shown in Fig 7

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V.COMPARISION WITH EXISTING TECHNIQUES

In this chapter we compare the proposed technique with existing techniques is given in the table 1 below

Table 1 Comparisons with existing techniques

Parameters	**Reference paper [11]**	**Reference paper[10]**	**Reference paper[9]**	**Proposed Method**
Slice Registers	3206	1867	440	1705
Fully Used FF-Pairs	2809	4096	4766	1177
Total	6015	5963	5206	2882

VI.CONCLUSION

In this paper, an algorithm that is suitable for implementation on FPGA Spartan 6 board for image enhancement. In VLSI the area is very important when it comes to implementation point of view. The proposed method starts with Acquire input image .Then the converting colour image to gray image. The Histogram is generated for the gray image. The Decision unit helps to know the contrast of original image. Low contrast then the contrast of an image is increased. Hence the quality of an image is improved.

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