



International Journal for Innovative Engineering and Management Research

A Peer Reviewed Open Access International Journal

www.ijiemr.org

COPY RIGHT



ELSEVIER
SSRN

2018IJIEMR. Personal use of this material is permitted. Permission from IJIEMR must be obtained for all other uses, in any current or future media, including reprinting/republishing this material for advertising or promotional purposes, creating new collective works, for resale or redistribution to servers or lists, or reuse of any copyrighted component of this work in other works. No Reprint should be done to this paper, all copy right is authenticated to Paper Authors

IJIEMR Transactions, online available on 19th Dec 2018. Link :

<http://www.ijiemr.org/main/index.php?vol=Volume-07&issue=ISSUE-13>

Title: **FPGA IMPLEMENTATION OF COIN DETETIONS USING MATLAB AND VERILOG**

Volume 07, Issue 13, Pages: 574–582.

Paper Authors

MS. K. PAVANI, MR. G. SAI KUMAR

Ashoka Institute of Engineering and Technology



USE THIS BARCODE TO ACCESS YOUR ONLINE PAPER

To Secure Your Paper As Per **UGC Guidelines** We Are Providing A Electronic Bar Code

FPGA IMPLEMENTATION OF COIN DETECTIONS USING MATLAB AND VERILOG

¹MS. K. PAVANI, ²MR. G. SAI KUMAR_{M.E}

¹M.Tech Scholar, VLSI System Design (ECE), Ashoka Institute of Engineering & Technology

²Assistant Professor, Department of ECE, Ashoka Institute of Engineering & Technology

¹kompallypavani@gmail.com, ²saikumar.724@gmail.com

ABSTRACT

Feature identification and acknowledgment is one of the fundamental undertakings in PC vision for applications like following, segment examination, and so forth. In this procedure, the pictures are naturally analyzed to extricate highlights which are novel to the items. In light of the separated highlights distinguishing proof of the protest is made. One of the applications is in Coin acknowledgment which is fundamental instead of tallying physically. It is anything but difficult to identify and perceive the coins outwardly by different highlights, values and in view of weights. A picture containing coins is perused for preparing were it finds the shapes which are in circle and they are adjusted and fragmented for finding the blob estimations like region, span and so forth., of marked roundabout protests after which the parallel organization of the picture is encouraged to the Xilinx for handling before it the picture is resized to 256 x 256 x16 and increment the brilliance, differentiate values for the best possible discovery and by utilizing the limited state machine. Through limited state machine confirm the coin is 1, 2, 5 and 10.

I INTRODUCTION

These days, Object Recognition and location are done in view of highlights, design and are utilized in many machine visionary frameworks; Coin acknowledgment has been generally utilized, in actuality, for example, in candy machines, banks, grocery stores and so on. It is likewise extremely helpful while grouping a gigantic measure of gathered coins from philanthropy associations and old relics. Notwithstanding day by day utilizes coin acknowledgment frameworks can likewise be utilized for the examination reason by the foundations or associations that arrangement with the old coins. To accomplish dependable acknowledgment, it is essential that the highlights separated from the preparation picture must be perceivable

even under changes in the picture scale, clamor and light. In the field of Machine Vision and Image Processing, Digital picture preparing, as a subcategory to the field of Digital Signal Processing, has numerous focal points over simple picture handling. It permits using all encompassing scope of calculations and procedures on input picture (information) and can keep away from issues, for example, the development of commotion and flag mutilation amid handling. Since pictures are characterized more than two measurements or increasingly, computerized picture handling might be demonstrated as multidimensional frameworks. Computerized picture preparing permits utilizing of a lot of supplementary complex calculations on

muddled information to disentangle the assignments, and that which are unthinkable by simple means. Specifically, computerized picture handling is the main down to earth innovation for: Classification, Feature extraction, Multi-scale flag investigation, Pattern acknowledgment. Picture Processing Based Coin Recognition System Classification: 1) Mechanical technique based frameworks, 2) Electromagnetic strategy based frameworks and 3) Image handling based framework The Mechanical technique based frameworks utilize parameters like range/distance across, thickness; weight and attraction of the coin for separate between the given coins. In any case, these parameters can't be utilized to separate between the diverse materials of the coins. It implies in the event that we give two coins one unique and other phony which have a similar span/distance across, thickness, weight and attraction however with various materials of mechanical technique based coin acknowledgment framework then it will regard both the given coins as unique coin so these frameworks can be tricked effectively by programmers. The Electromagnetic strategy based frameworks can separate between various materials on the grounds that in these frameworks the coins are gone through a wavering curl at a specific recurrence go and diverse materials acquire distinctive changes the sufficiency and recurrence. So these progressions and alternate parameters like range/distance across, thickness, weight and attraction can be utilized to separate between the coins. In the ongoing of year's coin acknowledgment frameworks in light of pictures have likewise come into the photo.

Coins are generally utilized in our day by day life, for example, candy machines, stopping meters, pay phones et cetera. Contrasted and paper cash, coins advantage from their incredible protection from scraped spot, and along these lines can be utilized for a significant long time. Notwithstanding being utilized as cash, individuals appreciate gathering coins as they as a rule have masterful esteem and can give a clear understanding to the social life ever. In any case, as of late, a considerable measure of illicit forging rings make and offer phony coins, which have made awesome misfortune and harm the general public. Consequently it is basic to have the capacity to distinguish counterfeit coins. This is likewise an imperative worry in the field of numismatics. Legal specialists might be utilized to inspect the presumed coins, yet it is improbable considering the expansive amounts of coins that must be analyzed. In this manner, a programmed counterfeit coin location framework is profoundly wanted.

II LITERATURE SURVEY

Loveneet Kaur, Rekha Bhatia their go for the coin acknowledgment frameworks that must be fundamental in the way as they ought to have the capacity to perceive coins through pictures proficiently regardless of whether clamor is available. Indian coin acknowledgment framework perceives the Indian coins of significant worth `1, `2, `5 and `10 with pivot invariance and order them as indicated by their value. The execution of coin acknowledgment framework is assessed under boisterous and also commotion free condition. An information picture is prepared for extricating highlights utilizing Discrete Wavelet Transform (DWT) and neural

systems are utilized for arrangement based on mean square blunder, time taken and number of ages to prepare the system. Whenever Gaussian and salt-and-pepper clamor is available middle and wiener commotion channels are utilized for picture improvement.

Sandeep Kaur et, Suchika Malik, Parveen Bajaj, Mukhwinder kaur in this paper presents bona fide coin acknowledgment framework in view of polar Fast Fourier Transform framework. There are essential need of this framework is mechanize the tallying and arranging of the coins. For this machines need to recognize the coins quick and precisely with respect to additionally handling relies upon this acknowledgment. Anyway the present accessible calculation to center fundamentally around acknowledgment of the cutting edge coins. In this paper they are utilized ANN (Artificial Neural Network) in view of computerized coin acknowledgment framework for the acknowledgment of current coins. At that point, this removed element is going excessively gone as info, making it impossible to the prepared neural system of 98.798% acknowledgment rate has been accomplished amid the analyses.

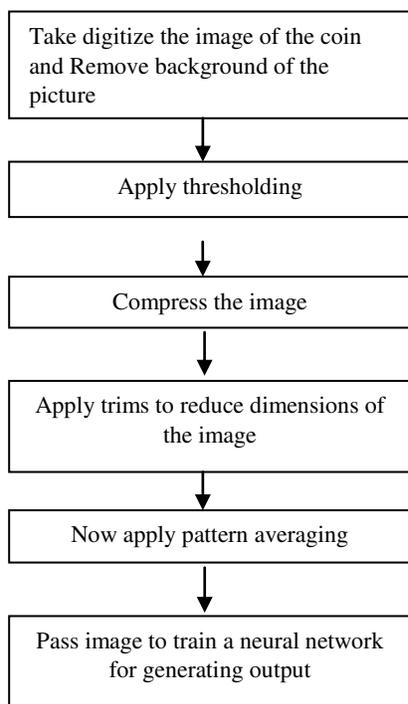
III EXSITING SYSTEM

The primary solution for the issue of picture coordinating, albeit simple in its tendency, was given by Hobrough as of now in late 1950s. A correlator, the primary framework managing programmed discovering conjugate focuses was displayed by Wild Heerbrugg Company in 1964. The framework did not locate a wide down to earth application. All things considered, Hobrough's concept of applying cross-relationship found a great deal

of successors. From mid 1970s the advancement concentrated on coordinating computerized pictures and advanced connection was effectively executed into photogrammetric frameworks (Helava, 1978). because of moderately high measure of crisscrosses that typically show up a high number of perceptions (repetition standard) and actualizing strategies for discovery and disposal of exceptions have a fundamental significance with a specific end goal to accomplish a high exactness (Ackerman, 1996a).Picture coordinating is routinely performed in the picture space. The idea of question space coordinating was additionally created (Helava, 1988) however it has not discovered down to earth applications up until now.A great deal of research has been finished as for programmed discovering tie focuses associating two covering pictures (a stereo match) or interfacing pictures inside a square. The look for comparing focuses should be possible in 2D, e.g. inside a square shape orientated along an estimated epipolar line if there should arise an occurrence of relative introduction of a stereo combine. In the event of known introduction parameters, the hunt can be limited just to one measurement i.e. specifically on an epipolar line as it is utilized in the determination of advanced height models. The key issue associated with picture coordinating is a decision of a coordinating element (crude that is contrasted and crude in different pictures) and a closeness measure (a quantitative measure assessing the match of elements). Coordinating 'pixel by pixel' over the entire covering region of pictures implies a tremendous measure of figuring's. Also, it prompts uncertainty because of a

monotonous event of dark qualities and because of commotion in pictures. Therefore, as a rule picture coordinating has a place with the gathering of not well presented issues. It

3.1 Existing Flow Diagram



From 3.1 stream visit consider the digitized picture of coin and expel foundation of coin picture after evacuate the foundation of the photo apply the thresholding technique cut level to swing to greyscale picture into a paired shape. Next process is pressure. In pressure we have two methods those are

1. Lossy compression
2. Lossless compression

In this we have utilize lossless pressure system to pack picture. After pressure trimming process is confirmed i.e. picture can be resized. Example averaging is connected to resized picture and normal qualities to the example can be computed.

doesn't satisfy criteria of a current, special arrangement that is steady as for little varieties in the info information

That picture can go to prepare neural system for age the yield.

IV. PROPOSED WORK

The present paper proposes the price winning algorithm. The proposed system roughly follows the ideas by considering the similarity of two coin images is computed by the use of registration techniques. In a first step, the translational pose of the coin is determined by a segmentation algorithm that makes an estimate of the coin's radius and its center. The comparison of two coins is done by aligning them with respect to their rotational pose, i.e. we have to optimize only one parameter, which makes the registration feasible. Having defined a similarity measure any classification scheme may be used. Because of the highly reliable embossing process for the coins we believe that a registration technique is the first choice to reach good results. The only difficulty is to find robust similarity measures that tolerate the, sometimes severe, abrasion and fouling of the coins, but still give response for the reliable embossment which determines the class membership. Additionally this similarity measure has to be computable in a fast manner such that the resulting algorithm can cope with large databases.

Verilog Implementation for Coin Detection

Block Diagram

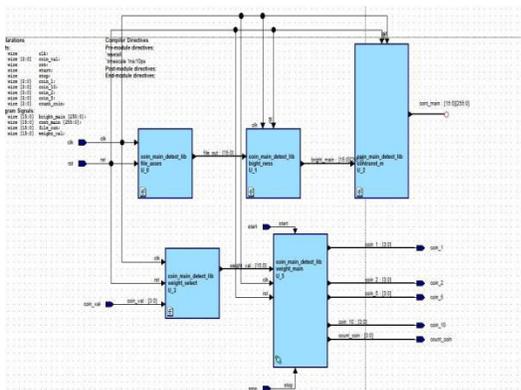


Fig: 4.1 Block diagram of coin counting

In this section brightness, contrast, counting operation can be performed. by counting process we can consider the state diagram in that 4 states are there 1,2,5 and 10 rupee states

Image Parameters for Identifying Objects and Count Values

Each background has to distinguish as with respect to objects or images depending upon the design requirement. So considering few pre-processing techniques for images which would estimate the mathematical consideration using the concept of brightness, contrast and Thresholding.

Brightness calculation using Verilog

Brightness manipulation is useful to enhance the brightness of image when image is captured in low light condition. After brightness manipulation it is easy to interpret the information in image easily. Brightness manipulation operations are commonly used for increasing and decreasing Brightness. After brightness manipulation, dark image may become brighter or bright image may become dark .If we add the constant value in

pixel value of image, then brightness manipulation operation increase brightness and similarly subtraction operator reduces the brightness as explained by following equation 1:

$$F(x, y) = \begin{cases} G(x, y) + t & \text{if } G(x, y) + t \leq 255 \\ 255 & \text{if } G(x, y) + t > 255 \end{cases} \quad (1)$$

Where $t \geq 0$

$G(x, y)$ – GreyLevelforInputPixel

$F(x, y)$ – GreyLevelforOutputPixel

Contrast Improvement

Contrast Enhancing is peculiar technique in image preprocessing stage where all of the intensity values of the input image are enlarged to occupy a wider range of values which could interpret the data in the image easily. From the following equation we could estimate the contrast as:

$$F(x, y) = \begin{cases} t_0 & \text{if } G(x, y) < g_0 \\ G(x, y) & \text{if } g_0 < G(x, y) < g_1 \\ t_1 & \text{if } G(x, y) > g_1 \end{cases}$$

Where $G(x, y)$ = GreyLevelforInputPixel

$F(x, y)$ = GreyLevelforOutputPixel

t_0, t_1 – ConstantValues

g_0, g_1 – greylevelforinputimagewhich

istobehighlighted

The main concept is to improve the brightness of the background image

Threshold Operation:

The concept of Thresholding of the Image representing conversion of gray scale information of the given image to stage two

level information. Considering, the foreground image which could consists of different gray scale values than the background image, where this approach would be an effective way for the segmentation. We apply this approach for the above consideration for the specified image as given below for following equations:

$$F(x, y) = \{G_0(x, y) \text{ if } G(x, y) < a_{th} \quad (1)$$

$$\{G_1(x, y) \text{ if } G(x, y) \geq a_{th}\}$$

Where $G(x, y) = \text{GreyLevelforInputPixel}$

$F(x, y) = \text{GreyLevelforOutputPixel}$

a_{th} is the Threshold Value

By using the above equation we estimate the each pixel value from the input image which are replaced by the surrounded pixels in the final output image as $G_0(x, y) = 0$ & $G_1(x, y) = 1$

Counting Algorithm

After the Thresholding objects are get separated from the background. So it becomes easier to find group of pixels in an image that somehow belong together for finding out number of objects in image. . By counting number of white pixels, numbers of objects are counted. Also we have utilized the concept of weight identifying, verifying and calculating using the desired values from the LUT where each coin has specific weight and represented accordingly.

V. RESULTS AND DISCUSSION

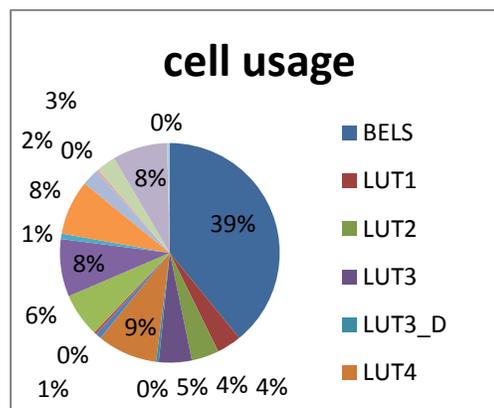


Fig. 5.1 coin counting cell usage

Device utilization summary

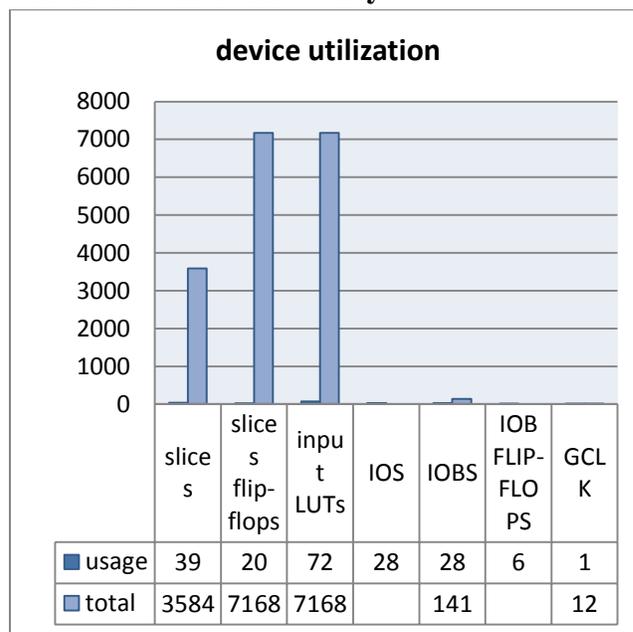


Fig. 5.2 coin counting device

Outputs



Fig: Image showing the circle detection given input image

Above result is circle detection of given input image. In given input contains different coins with different sizes through circle detection algorithm we can detect the coins in the image.

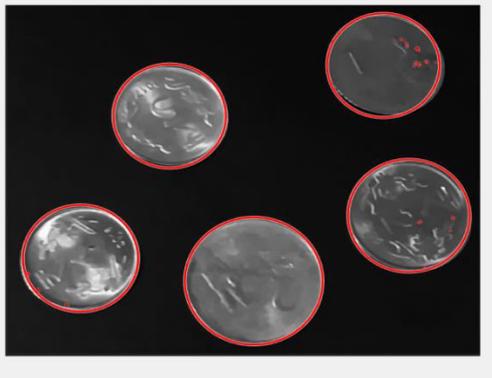


Fig: Image showing the circle detection given input image

Above result is circle detection of given input image. In given input contains different coins with zoomed sizes through segmentation and c-means algorithm we can detect the coins in the image.

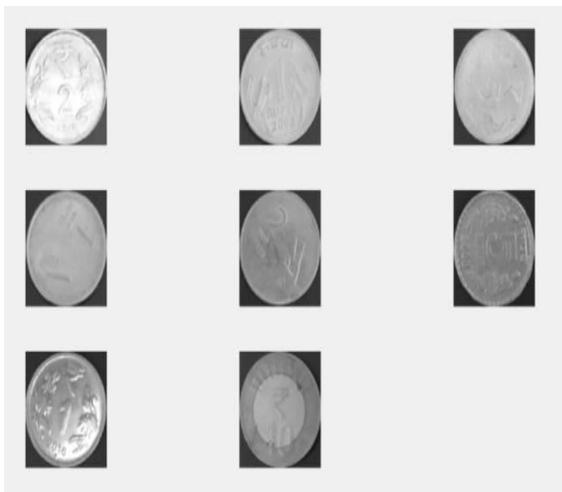


Fig: Image showing the gray scale segmented output of input image .

In above result is gray scale image of input image. In this circle Hough transform used to detection.

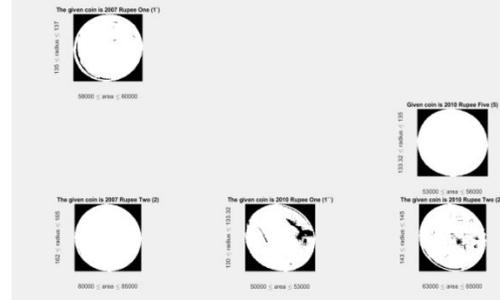


Fig: Image showing the segmented output with area and radius

calculations of given input image In above result by using segmentation coins are detected and area and radius also mentioned. In segmentation total image can be portioned in to smaller area images.

RST CONDITION: FROM 1 TO 0

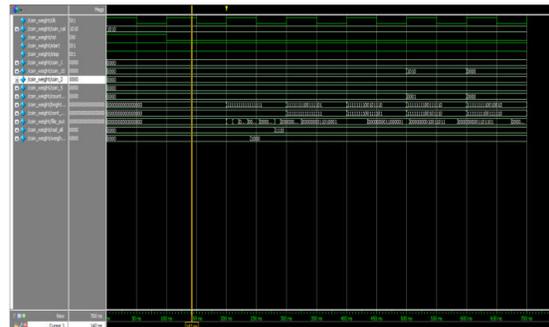


Fig: reset value changes from 1 to 0.

In Above verilog result of coin counting .in this reset condition changed 1 from 0.result can observed at reset condition 1.

RST CHANGED TO 0 TO 1

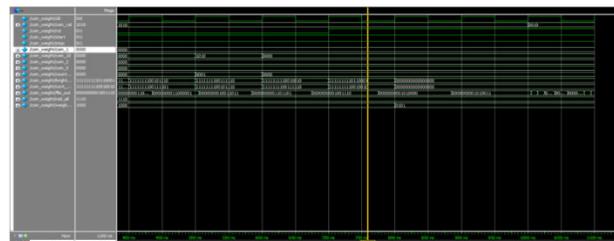


Fig reset value changes from 0 to 1.In above figure reset value is changed from 0 to 1.reset is 1 all the inputs and output values are initial stage.

DATA CHANGES FROM 1010 TO 0010

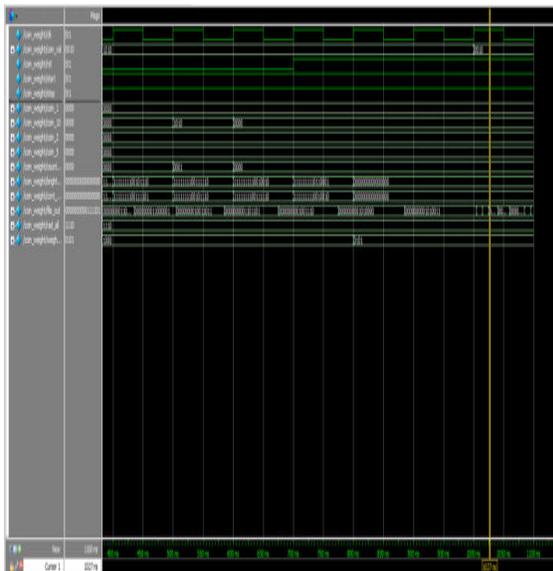


Fig:Data Changes From 1010 To 0010

In this output coin value is changed from coin_10 to coin_2. After counting of 10 rupee reset value is changed to 1 .all values are initialized. Next reset changed to 0 then coin_2 is counted .count of 2 rupee is 2.

OUTPUT OBSERVED:

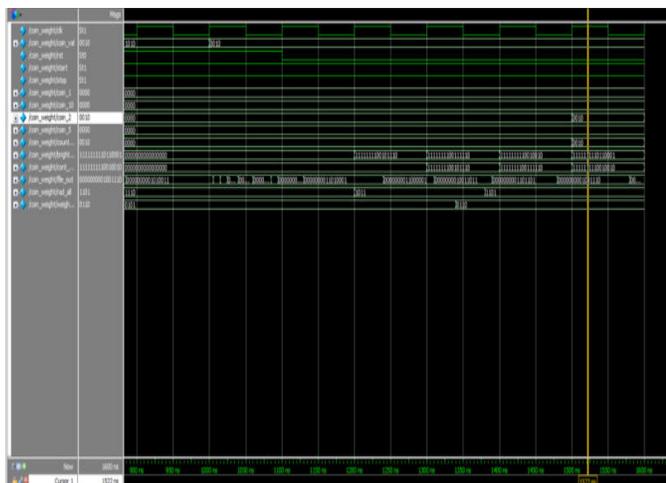


Fig output of all coins

In above figure we can observe the all the coin outputs. The output values of the coins are coin_1 is 3, coin_2 is 2, coin_5 is 2 and coin_10 count is 1.

CONCLUSIONS

This paper focused on different systems for coin recognition based on image processing. In Table we compared all researchers' work which is really helpful for study at a glance. Future work can be done to achieve 100% accuracy. However there are so many methods has been proposed till now for modern coins, but still very less work has been done for the recognition of a coin whose physical state is not that much better (present coins).From the concept of existing design which are dolt with radius and segmentation based. Modeling and implementation has been verified accordingly with respect to proposed design. Now we have proposed the concept of dual modeling and implementation on Matlab and Verilog. Which would identify and recognize coin based on Matlab and its output would be processed considering the counting and the weight calculations. This has been implemented in Verilog. Our proposed concept would provide a novel approaches for images brightness and contrast calculations in Verilog specifically to identify radius based coin values.

REFERENCES

- [1] R C Gonzalez, R E Woods, "Digital Image Processing" 3rd Edianalysisarson Prentice Hall, 2004.
- [2] Sparsh Mittal, Saket Gupta,and S. Dasgupta3 "FPGA: An Efficient And Promising Platform For Real-Time Image Processing Applications" Proceedings of the National Conference on Research and Development in Hardware & Systems (CSI-RDHS 2008) June 20-21, 2008, Kolkata, India.



- [3] Iuliana CHIUCHISAN, Marius CERLINCA, Alin-Dan POTORAC, Adrian GRAUR "Image Enhancement Methods Approach using Verilog Hardware Description Language" 11th International Conference on Development And Application Systems, Suceava, Romania, May 17-19, 2012
- [4] Stephen Bailey , "Comparison of VHDL, Verilog and SystemVerilog", Digital Simulation White Paper by Model Technology.
- [5] S.Sowmya, Roy paily, "FPGA Implementation of Image Enhancement Algorithm," 978-1-4244-9799-7/111 IEEE 2011.
- [6] M.Chandrashekar, U.Naresh Kumar, K.Sudarshan Reddy, and K.Nagabhushan Raju, "FPGA Implementation of High speed Infrared Image Enhancement," International Journal of Electronic Engineering Research vol.1, no. 3 2009, pp.279-285.
- [7] Tarek.M.Bittibssi,Gouda Salama,Yehia.Z.Mehaseb, and Adel.E Henawy, "Image enhancement Algorithms using FPGA," International Journal of Computer Science and Communication Networks vol.2, no. 4, pp. 536-542.
- [8] U. Bidarte, J. A. Ezquerria, A. Zuloaga, J. L. Martín "VHDL Modeling of an Adaptive Architecture for Real-Time Image Enhancement"
- [9] Azeema Sultana, Dr. M. Meenakshi, "Design and Development of FPGA based Adaptive Thresholder for Image Processing Applications", 978-1-4244-9477-4/11 IEEE 2011.
- [10] FANG Yi-yuan, CHEN Xue-jun, "Design and Simulation of UART Serial Communication Module Based on VHDL", 978-1-4244- 9857-4/11 IEEE 2011.
- [11] Pong P. Chu , "FPGA PROTOTYPING BY VHDL EXAMPLES", John Wiley & Sons, Inc.2008. [12] Douglas Perry, "VHDL" 3rd Edition, Tata Mcgraw-Hill,2001.



International Journal for Innovative Engineering and Management Research

A Peer Reviewed Open Access International Journal

www.ijiemr.org



International Journal for Innovative Engineering and Management Research

A Peer Reviewed Open Access International Journal

www.ijiemr.org



International Journal for Innovative Engineering and Management Research

A Peer Reviewed Open Access International Journal

www.ijiemr.org