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Identification of Fake Currency Based on HSV Feature Extraction of Currency Note

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Abstract: ***Every country uses various shapes of currencies for smooth running of their economics. The currencies in different countries are differentiated by their size, shape and color. There are multiple people who works for money exchange requires correctness of these varied quantity of currencies. Also there is problem of fake currency notes. Fake notes are a problem of almost every country but India has been hit really hard and has become a very acute problem. Hence they require an efficient and effective technique for real currency identification. In this work we propose a novel technique for checking whether note is fake or real. This method provides fast and accurate procedure for fake currency note recognition.***
Keywords— Security Features, Currency Recognition & Converter, Image Processing

I. INTRODUCTION

In the last few years a great technological advances in colour printing, duplicating and scanning, counterfeiting problems have become more serious. Every country uses various shapes of currencies for smooth running of their economics. The currencies in different countries are differentiated by their size, shape and color. There are multiple people who works for money exchange requires correctness of these varied quantity of currencies. Also there is problem of fake currency notes. Fake notes are a problem of almost every country but India has been hit really hard and has become a very acute problem. Hence they require an efficient and effective technique for real currency identification [1][2].

In this work we propose a novel technique for checking whether note is fake or real. This method provides fast and accurate procedure for fake currency note recognition.

II. APPLICATIONS OF CURRENCY RECOGNITION

Recent years have seen an increased interest in currency recognition system worldwide. And this is because of the various potential applications it has [3].

Distinguishing original note from counterfeit currency- One important application is to distinguish original note from counterfeit currency so that it would be very helpful in encountering the counterfeit note that is flowing throughout economy.

Automatic selling-goods-The system must be very helpful for automatic selling goods. Vendors may sometimes get confuse when there is a huge crowd in a market. There is a possibility of being miscalculation on some of the goods. So the system will help vendors in keeping records of goods sold and the amount received.

Banking Applications- The system should be very helpful in banking application such as counting of notes and its value during monetary transactions, detection of counterfeit notes, etc. Such a system will make the banking process a trustworthy and reliable process. As time is the important factor in today's world so such system will be helpful in saving time too.

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III. PROBLEM FORMULATION

Automatic methods for paper currency recognition become important in many applications such as automated teller machine and automated goods seller machines. This system is designed to recognize and verify the Indian paper currency. The approach consists of a number of steps including image acquisition, gray scale conversion, edge detection, feature extraction, image segmentation and comparison of images as shown in figure 1 [4][5].

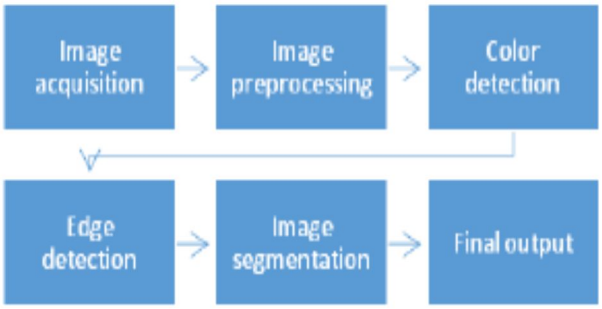

Figure 1: Block diagram of paper currency recognition

A. Image Acquisition

Image is acquired by digital camera by applying the white backlighting against the paper currency so that the hidden attributes are able to appear on the image of the currency.

B. Gray-scale conversion

The image acquired is in RGB color. It is converted into gray scale because it carries only the intensity information which is easy to process instead of processing three components R (Red), G (Green), B (Blue). Image is acquired in step 1 is large to continue process and colour information is not needed, except the colour index. First, RGB image is converted to pixel values and then to gray scale [6][7].

C. Edge detection

It is the fundamental tool in image processing, which aim at identifying points in digital image at which the image brightness changes sharply or has discontinuities. There are many ways to perform edge detection. . Edges are detected of the gray scale image of paper currency using Sobel operator. It smoothes the image and calculate the gradient of the image. Edge detection is one of the fundamental steps in image processing, image analysis, image pattern recognition, and computer vision techniques.

D. Image segmentation

Segmentation is the process of partitioning a digital image into multiple segments. It is typically used to distinguish objects from backgrounds. Here edge based segmentation is performed on the image. Image segmentation sub divides the image into its constituent regions or objects [8].

E. Feature extraction

Now the features are extracted using edge based segmentation and objects and background are separated. It is a challenging work in digital image processing. In any currency recognition system, feature extraction is one of the most challenging tasks. Here, the aim is to analyze and identify the unique and distinguishing features of each denomination under various challenging conditions such as old notes, worn out notes, also under different illumination and background [9][10].

F. Comparison

Lastly the extracted features are compared with the extracted features of original currency by calculating the number of black pixels of segmented image. If the pixels of segmented image of test currency are approximately equal to the pixels of segmented image of original currency then the currency is found to be genuine otherwise counterfeit.

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G. Output

The output will be currency denomination and either "The note is Genuine" or "The note is fake" at a time anyone will be display.

IV. PROPOSED ALGORITHM

The aim of our system is to help people who need to recognize different currencies, and work with convenience and efficiency. With development of modern banking services, automatic methods for paper currency recognition become important in many applications such as vending machines. It is very difficult to count different denomination notes in a bunch. This thesis proposes an image processing technique for paper currency recognition. The extracted region of interest (ROI) can be used with Pattern Recognition and Neural Networks matching technique [11].

The image processing approach is discussed with MATLAB [12] to detect the features of paper currency. In this method we accept image of the note of any country. Then we extract its features in the form of hue, saturation and intensity value. The main feature that extracted is security thread feature of currency note. Now every currency note contain a continuous one line. If there are less than one line or more than one line then note is fake.

A. Algorithm

1) Obtain the image of the currency note whose authentication need to be checked using Camera, Scanner etc.
2) Perform image preprocessing operations such as blurring, grayscale conversion, thresholding, noise removal using filters.
3) "Detect the boundaries and extract the ROI (Region of Interest) using cropping".
4) Extract the desired features using HSV technique.
5) Compare the extracted feature values with ideal feature values of real note.
6) Display the result for note authentication.

B. Description of the Proposed Algorithm

Aim of the proposed algorithm is to develop an algorithm which can be easily applied to number of different currencies and has good efficiency and high speed.

Step 1: Obtaining the Image:
An Image can be obtained using number of different equipments, such as cameras or Scanner.

Step 2: Pre processing Operations:
Pre processing operations are required to alter the nature of the image, which makes extraction of features easier. In this particular case, pre processing operations involve, blurring, grayscale conversion, thresholding, noise removal using filters, color blurring RGB to HSV conversion. These operations help us in detecting boundaries, cropping the ROI and Calculating color features.

Step 3: Boundary Detection and cropping:
For boundary detection, we require a binary image, which has only 2 colors, black and white. All we do in this process is simply, separate the background and the foreground, and separate the ROI.

Step 4: Feature extraction:
The next step is to extract required information from the cropped ROI image. So from the binary image we find out the dimensions of the currency and find out the aspect ratio, aspect ratio remains same in all light conditions, so it becomes an important feature for recognizing image. Then we compare the aspect ratio of the target image with the ideal aspect ratios of all the denominations of that particular currency. The other features we extract are H, S and V of particular blocks of the currency. We divide the currency in number of blocks. We extract the HSV values of all the pixels and take average of their H, S, V features and again compare them with the values from the database.

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We use Euclidian distance equation for finding out the average values of the differences between the target and Ideal HSV features [6]

$$d(p, q) = \sqrt{(h2 - h1)^2 + (S2 - S1)^2 + (V2 - V1)^2}$$

Where,
(H1, S1, V1) = Target image feature set
(H2, S2, V2) = Ideal feature set.
HSV is abbreviated to Hue, Saturation and Value. Hue is pure color and is measured by degrees or percentage. Saturation is the radius in the circle. Value (V = 1 or 100%) corresponds to pure white (R = G = B = 1) and to any fully saturated color.
Step 5: Displaying results
To display the results, we have built a graphical User Interface; where we are providing a various graph to identify fake currency according to extracted feature.
Figure 2 below shows the basic process for fake currency recognition for currency of any country.

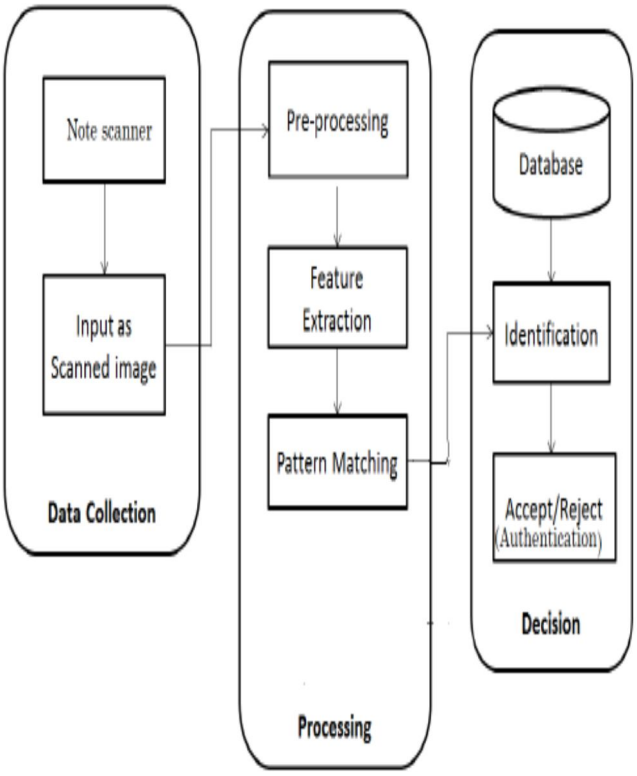

Figure 2: The basic process for fake currency recognition for currency of any country.

V. IMPLEMENTATION & RESULTS

In a paper currency we want to check the strip is broken or solid line. For that we took a picture with the background a strong light. We cropped the image at the position where the strip (security thread) exist and finally count the black pixels.
The security thread is a security feature of many banknotes to protect against counterfeiting. It consists of a thin ribbon that is threaded through the paper notes. Usually, the ribbon runs vertically, and is woven into the paper. It has characters engraved on it. Threads are embedded within the paper fiber and can be completely invisible or have a star burst effect, where the thread appears to weave in and out of the paper when viewed from one side. However when held up to the light the thread will always appear as a solid line.

Features can be built into the thread material e.g. it is a difficult feature to counterfeit but some counterfeiters have been known to print a thin grey line or a thin line of varnish in the area of the thread. Security threads can also be used as an anti-counterfeiting device in passports.

Implementation steps are listed below

Step 1: Read in the Image

Step 2: Decompose image into HSV and analyse

Step 3: Threshold the saturation and value planes to create a binary image

Step 4: Do some minor closings

Step 5: Final cleanup

Step 6: Count the number of black lines

Figure 3 to 8 shows the results of my implementation.

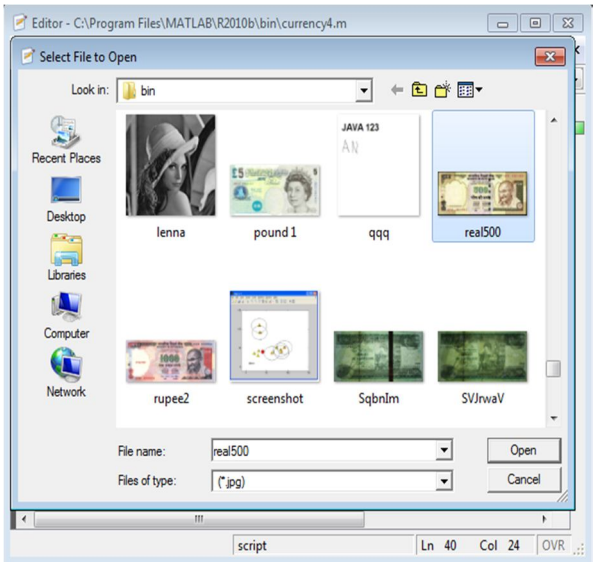

Figure 3: Selecting image of note for testing

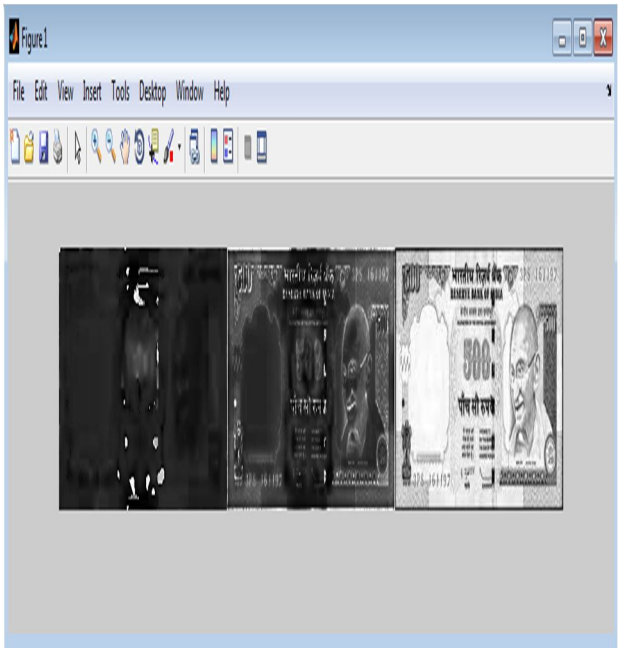

Figure 4: Decomposition of image into HSV

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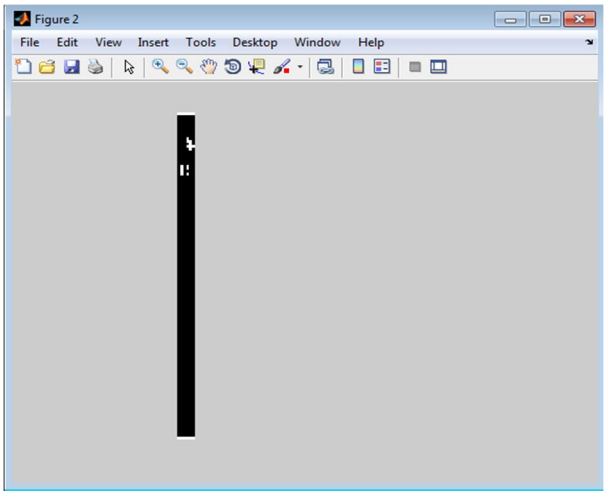


Figure 5: Threshold the saturation and value planes of note Image

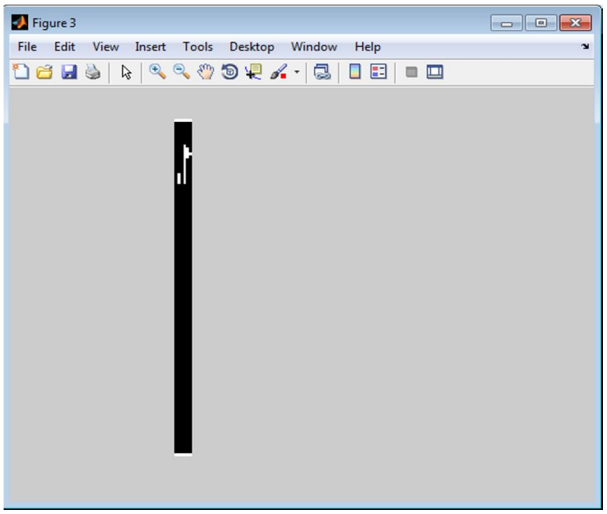


Figure 6: Minor Closing of note Image

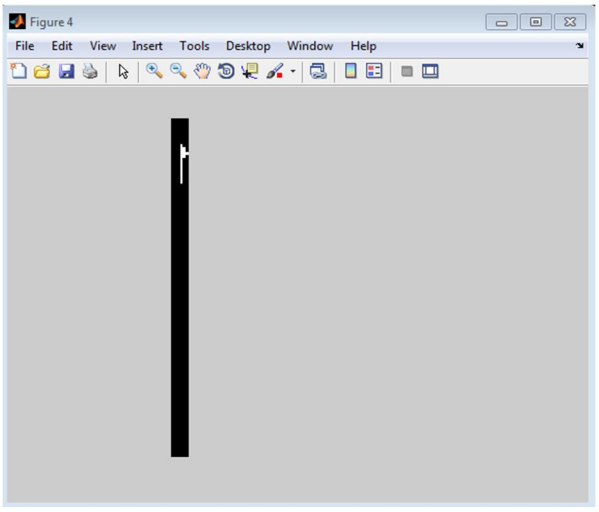


Figure 7: Final Cleanup of noisy area of note Image

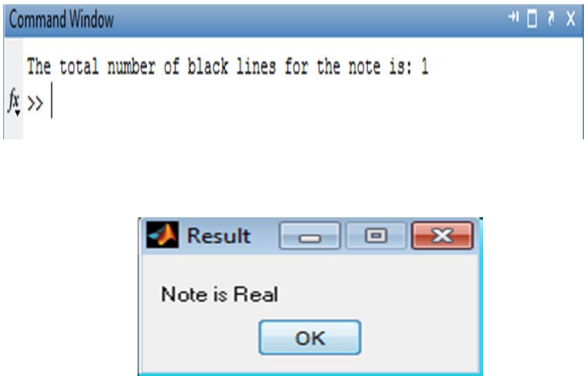


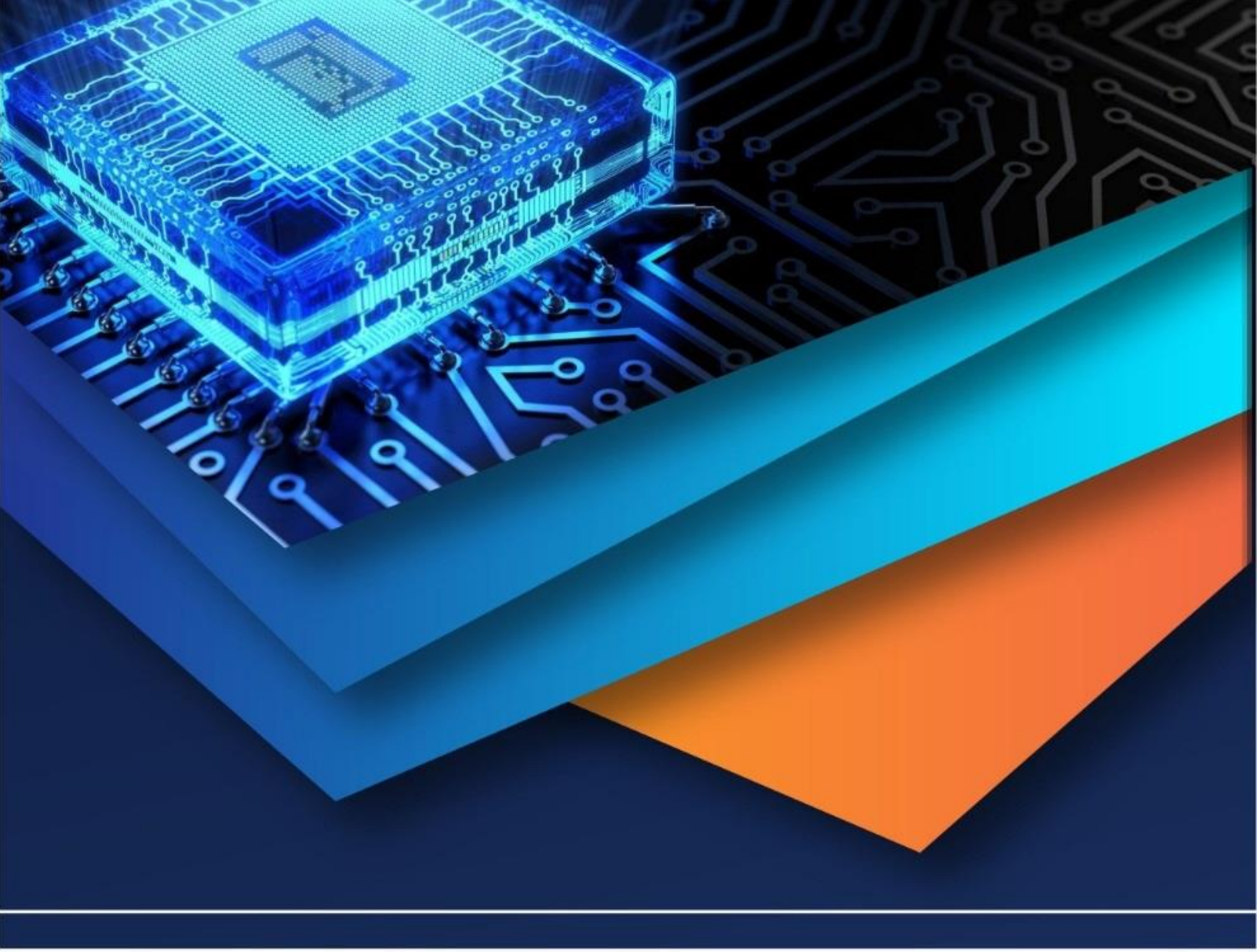
Figure 8: Displaying the final result

VI. CONCLUSION

The currencies in different countries are differentiated by their size, shape and color. There are multiple people who works for money exchange requires correctness of these varied quantity of currencies. Also there is problem of fake currency notes. Fake notes are a problem of almost every country but India has been hit really hard and has become a very acute problem. Hence they require an efficient and effective technique for real currency identification. In this work we propose a novel technique for checking whether note is fake or real. This method provides fast and accurate procedure for fake currency note recognition.
In this paper we proposed HSV (Hue Saturation & Intensity Value) feature extraction approach of currency note.

REFERENCES

[1] Amol A. Shirsath1 and S. D. Bharkad, "A currency recognition system" International Journal of Research in Engineering and Technology, 2013 pp 2321-7308.
[2] Kishan Chakraborty, Jordan Basumatary, Debasmita Dasgupta, "Recent Developments in Paper Currency Recognition System" IJRET: International Journal of Research in Engineering and Technology Volume: 02 Issue: 11 | Nov-2013.
[3] Rubeena Mirza, Vinti Nanda, "Paper Currency Verification System Based on Characteristic Extraction Using Image Processing", International Journal of Engineering and Advanced Technology (IJEAT) ISSN: 2249 –8958, Vol-1, Issue-3, Feb 2012.
[4] R. C. Gonzalez and R. E. Woods, Digital Image Processing, 2nd ed., Prentice Hall India, ISBN-81-203-2758-6, 2006.
[5] Ms.Rumi Ghosh, Mr Rakesh Khare, "A Study on Diverse Recognition Techniques for Indian Currency Note" ,IJESRT, Vol.2, Issue 6, June 2013
[6] Pragati D Pawar and Shrikant B. Kale, "Recognition of Indian Currency Note Based on HSV Parameters", ISSN 2319-7064, Vol 3, Issue 6, Jun 2014.
[7] http://www.rbi.org.in/currency/
[8] Vipin Kumar Jain, Dr. Ritu Vijay, "Indian Currency Denomination Identification Using Image Processing Technique" International Journal of Computer Science and Information Technologies (IJCSIT), Vol. 4 (1) , 2013, 126 – 12
[9] Hanish Agarwal and Padam Kumar, "Indian currency note Denomination recognition using color images", International Journal of Computer Engineering and Communication Technology, ISSN 2278-5140, Vol 1, Issue 1.
[10] Dipti Pawade, Pranchal Chaudhari and Harshada Sonkamble, "Comparitive Study of Different Paper currency and coin currency Recognition Method", International Journal of Computer Application, ISSN 0975-8887, Vol 66, No 23, Mar 2013.
[11] Rumi Ghosh and Rakesh Khare," An Elegant Neural Network based draw near for currency Recognition", Journal of Environmental Science, Computer Science and Engineering and Technology, JECET; June – August-2013; Vol.2.No.3, 876-882.
[12] MATLAB Applications for the Practical Engineer by Kelly Bennett, InTech, 2014.



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