International Journal of Latest Trends in Engineering and Technology
Special Issue SACAIM 2017, pp. 598-602
e-ISSN:2278-621X

FAKE INDIAN CURRENCY DETECTION USINGIMAGE PROCESSING

Saiyed Mohammed Arshad[1], DevdattSawantSudagar[2] & Nausheeda B S[3]

Abstract: - Fake Currency Detection is the biggest problem faced by many countries including India. Though Banks and other large organizations have installed Automatic machines to detect fake currency notes, it is really difficult for an average person to distinguish between the two. Counterfeiting of money is as old as money itself, and is sufficiently prevalent throughout history that it has been called "the world's second oldest profession. This has led to the increase of corruption in our country hindering country's growth. Some of the methods to detect fake currency are water marking, optically variable ink, security thread, latent image, techniques like counterfeit detection pen and using MATLAB version 13.
Keywords - Counterfeiting, Fake Currency, Image Acquisition, Binararization, Image segmentation, security thread

1. INTRODUCTION

In India Reserve Bank of India is only bank which has the full authority to issue bank notes. But some people are Counterfeiting currencies. The value of fake currency in circulation at any given time is Rs 400 crore, according to a study.Out Of the 90.26 billion Indian currency notes in circulation in 2015-16, no more than 0.63 million,That is seven in every million– were detected as fake, according to RBI data. The value of these fake notes in 2015-16 was Rs 29.64 crore of the Rs 16.41 lakh crore currency in circulation.Fake Indian Currency ofRs100, Rs500 andRs 2000 are injected into the system and there is no proper way to deal with them for a common Man. Common Man fall prey to this currencies. Manual testing of all notes are not efficient and it is difficult for anyone to identify the differences Fake Currency and Real Currency. Therefore Automatic methods for bank note recognition are required. Extracting sufficient monetary characteristics from the currency image is essential for accuracy and robustness of the automated system. Involving machines (independently or as assistance to the human experts) makes notes recognition process simpler and efficient.In this project we have made fake currency note detection technique using MATLAB and feature extraction with HSV color, space bwimage, thresh and other applications of image processing.

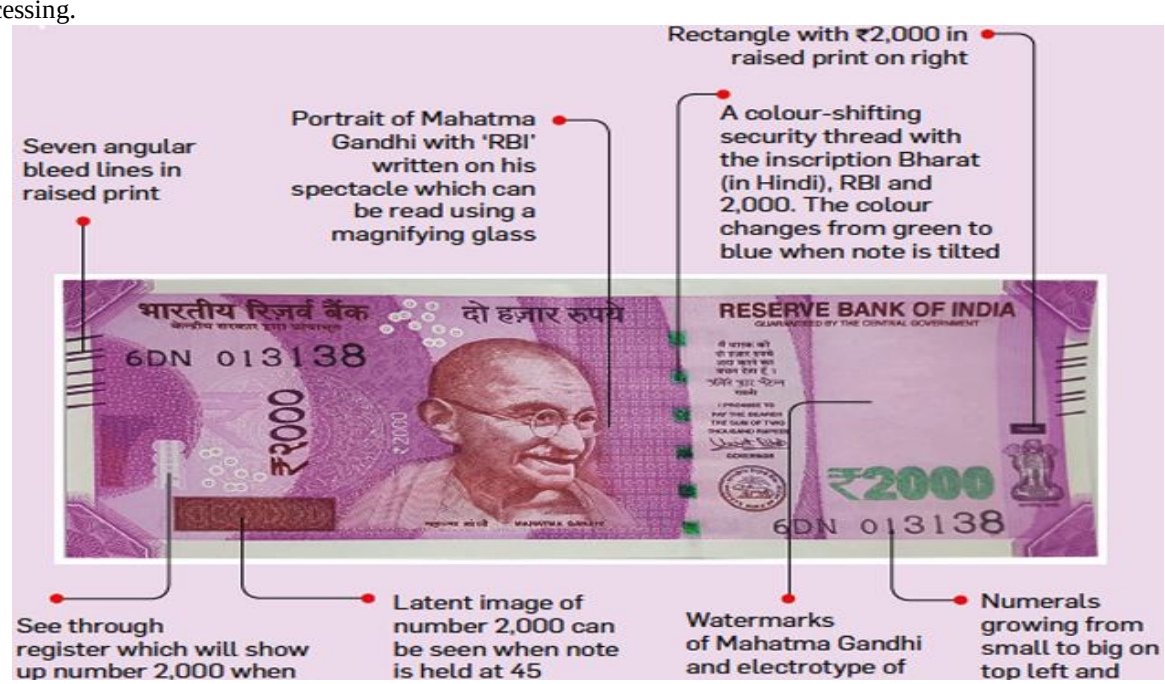

Fig 1. Features of 2000 rupees

[1] Department of Information Technology& Bioinformatics, AIMIT, St. Aloysius College, Mangaluru, India
[2] Department of Information Technology & Bioinformatics, AIMIT, St. Aloysius College, Mangaluru, India
[3] Department of Information Technology & Bioinformatics, AIMIT, St. Aloysius College, Mangaluru, India

2. LITERATURE REVIEW

Counterfeiting of money is not a new problem and has been present since the coinage of money was started by the Greek in around 600 B.C. During that time, the edges of coins were used to be clipped off to get precious metal and the metal was used to make counterfeit coinage [1]. Paper money came inexistence in 1200s in China using the wood of mulberry trees. During that time, the guards used to look after mulberry forests and counterfeiting of money were punishable by death. History tells us that counterfeiting of money has been an old evil [2]. Security features of a currency are critical for determining real and fake currencies. Common security features include watermarks, latent images, security thread, intaglio, optically variable ink, micro lettering and fluorescence [3].

3. PROPOSED WORK

The system will work on two images, one is original image of the paper currency and other is the test image on which verification is to be performed. The proposed algorithm for the discussed paper currency verification system is presented as follows-

A. Image of paper currency will be acquired by simple scanner in .jpg extension.
B. The image processing will be implemented on this image.
C. The various characteristics of the paper currency will be cropped and segmented.
D. After segmentation, the characteristics of the paper currency will be extracted.
E. The extracted characteristic of test image then undergoes classification.
F. On the basis of classification the result is generated.

In the proposed method characteristics of paper currencies are employed that are used by people for
Differentiating different banknote denominations. Basically, at first instance, people may not pay attention to thedetails and exact characteristics of banknotes for their recognition, rather they consider the common characteristicsof banknotes such as the size, the background color (the basic color), and texture present on the banknotes. So weare implementing some different way or typical features of currency detection.

4. METHODOLOGY

Image processing based currency recognition technique consists of few basic steps like image acquisition,its pre-processing and finally recognition of the currency.Image processing generally involves three steps:

1. Import an image with an optical scanner or directly through digital photography.
2. Manipulate or analyze the image in some way.
3. Output the result. The result might be the image altered in some way or it might be a report based on analysis ofthe image.

The Flowchart of the steps involved in methodology is as follows:

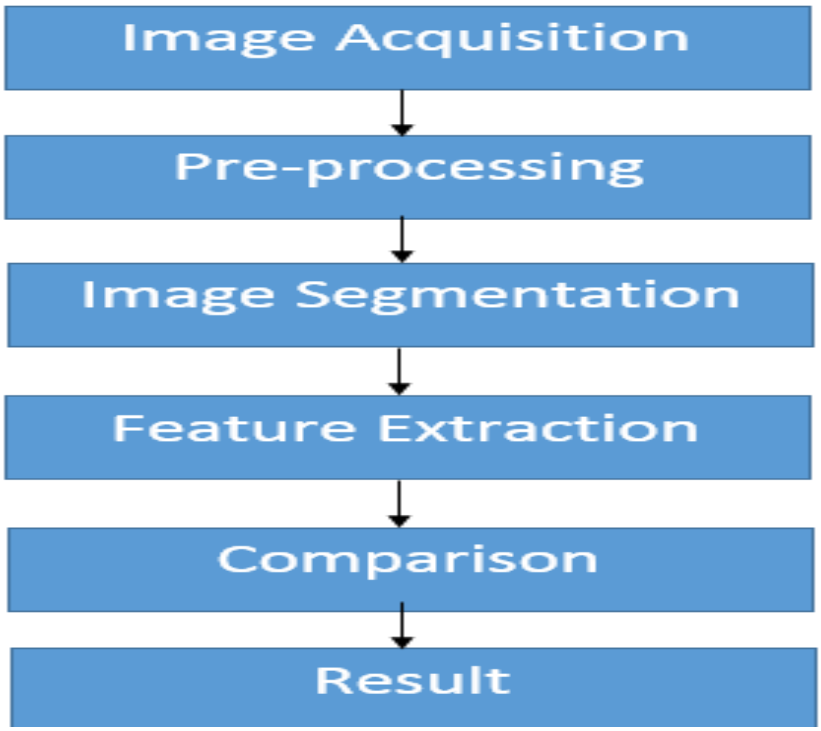

Fig 2. Design flow of fake currency detection

4.1 Image Acquisition (Input Image)

Image acquisition in image processing can be broadly defined as the action of retrieving an image fromsome source, usually it is a hardware-based source, so it can be passed through whatever processes need to occurafterward. Performing image acquisition in the process of image processing is always the first step in the workflow sequence because, without an image, no processing is possible. The image that is acquired is completely

Unprocessed and is the result of scanner which was used to generate it, which can be very important in some fields tohave a consistent baseline from which to work. One of the ultimate goals of this process is to have a source of inputthat operates within such controlled and measured guidelines that the same image can, if necessary, be nearlyperfectly reproduced under the same conditions so anomalous factors are easier to locate and eliminate.

4.2 Preprocessing

Image pre-processing is done to strengthen or intensify some of the features of image important for future analysis and processing. Noise from the separated image is eliminated using median filter. Median filter is basically dependent upon a moving window over the entire image and calculating the resultant pixel value as the median value of the brightness value in the present window. The resulting smoothed image channels are restored. Another pre-processing adopted was to normalize the size of various currency notes by keeping the same aspect ratio. The aspect ratio can be defined as the ratio of the width of the note to that of the height of the net. Unlike the size of the image the aspect ratio of note of particular denomination is independent of the distance from which the photo of the image has been taken. In the proposed approach, we kept the aspect ratio of (66, 166).

Image is then converted into Grayscale as Image processing uses the concept of 'comparing' sections in an image. Comparison in Grayscale involves simple scalar algebraic operators (+, -). But differentiate colors are required, the methods are a bit more complex. Usually, to get good results, some kind of Vector difference is needed. This is computationally more complex, and still does not provide guaranteed better results. Intensity data is usually sufficient. Grayscale (i.e. intensity) is usually sufficient to distinguish edges.As seen here, processing colour is complex, and Grayscale provides an easy way out. However, it is true that colour image processing can provide better results. The hard part is ensuring correct calculations. Image Binarization is also achieved based on the threshold. im2bw() function converts the grayscale image to a binary image.

4.3 Image Segmentation

It determines region boundaries in an image. It can explore many different approaches to an image

Segmentation& thresholding. Optimal Global Thresholding:

1.A threshold is said to be globally optimal if the number of misclassified pixels is minimum.

2 Histogram is bimodal (object and background)

3 Ground truth is known OR the histograms of the object and the background are known.

4.4 Feature Extraction

Feature extraction a type of dimensionality reduction that efficiently represents interesting parts of an image as a compact feature vector. This approach is useful when image sizes are large and a reduced feature representation is required to quickly complete tasks such as image matching and retrieval. Some features of an image are:

Size or Area. Every denomination differs from each other in the size parameter. Therefore size can be used as a feature for currency recognition. But the major limitation of this feature is that the size of the image varies depending on the distance from which photo of the image has been taken. To overcome this problem a new parameter named aspect ratio was used to classify the denominations.

4.5 Comparison

In our comparison the features extracted from the images of the currency notes plays a very crucial role. In facts, it is the comparison of the features that enables us to differentiate fake notes from the real ones. To compare the performance, we have segmented the image and then we remove from a binary image all connected components (objects) that have fewer than P pixels, producing another binary image. The above step is repeated three times to get the binary image which can be compared. Then we compare the two images and store the difference.

4.6 Result

The experiments were performed to identify the fake currency note of Rs 2000. The images were acquired using the camera and then features were extracted from the acquired images using the technique proposed in section IV.

The identification between real and fake currency was done on the basis of dissimilarity and discontinuity between them.The extracted features were used for fake currency detection. The decision weather a note is fake or real was made by comparing the values of the two notes.

5. EXPERIMENTAL RESULTS

Fig 3. Image processed and converted to grayscale

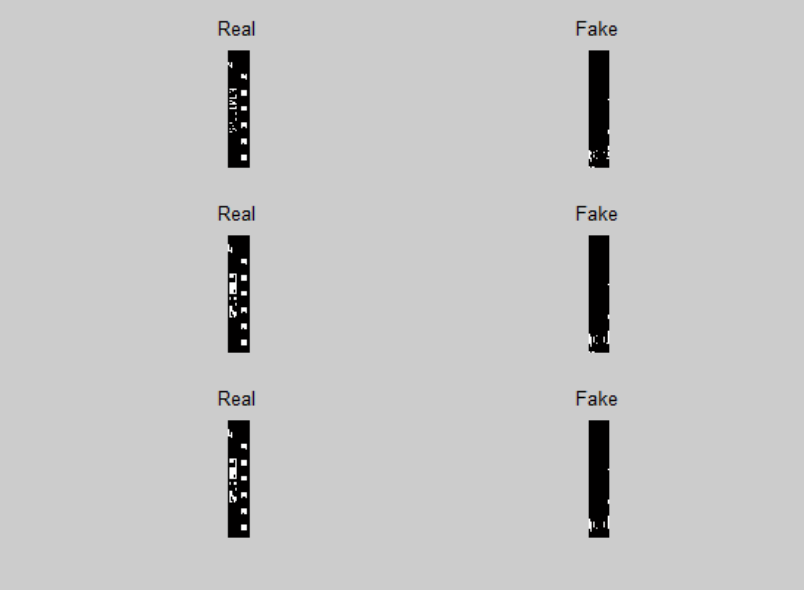

Fig 4. Grayscale image cropped and converted to binary image

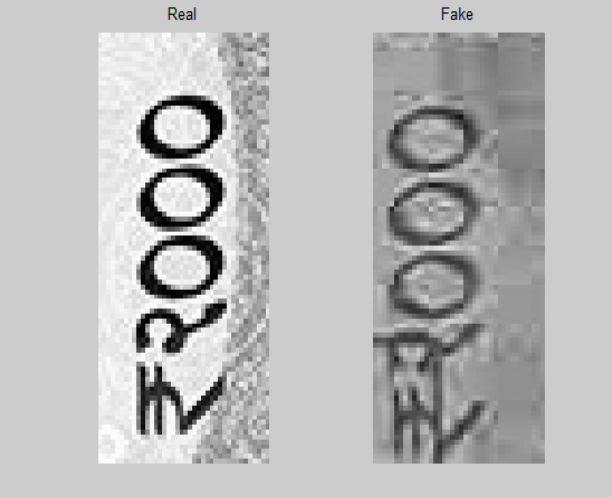

Fig 5. Image cropped and enlarged for comparing.

6. CONCLUSION

The main motivation behind this project was to make a system for common man which is fast and easy to use. This is a MATLAB based system for automatic recognition of fake and genuine Indian currency. This is a low cost system, using effective and efficient image processing techniques, provide accurate and reliable results at good throughput as shown by experimental results. The developed Matlab code works for Indian currency of Rs. 2000.

7. REFERENCES

[1] Binod Prasad Yadav, C. S. Patil, R. R. Karhe, P.H Patil , "An automatic recognition of fake Indian paper currency note using MATLAB", IJESIT, Volume 3, Issue 4, July 2014

[2] NeeruRathee, ArunKadian, RajatSachdeva, "Feature Fusion for Fake IndianCurrencyDetection"

[3] Sagar S. Lawade1, Gayatri S. Hedau2, Apurva C. Ramgirwar3, "FAKE CURRENCY DETECTION USING IMAGE PROCESSING", International Journal of Research In Science & Engineering, Volume: 1.

[4] http://electronicsforu.com/electronics-projects/software-projects-ideas/image-processing-using-matlab

[5] http://www.rbi.org.in/currency/

[6] https://www.tutorialspoint.com/dip/

[7] Fundamentals of Image Processing- eBook