

# A Review on Fake currency detection using feature extraction

Ms. Namrata Rathore<sup>1</sup>, Mrs. Jyotsna Sagar<sup>2</sup>

<sup>1</sup>M. Tech. Research Scholar, <sup>2</sup>Assistant Professor

Department of Electronics & Communication, Sri Satya Sai University of Technology and Medical Sciences, Sehore, (Madhya Pradesh), India

**Abstract** – Fake currency identification is a significant issue around the world, influencing the economy of pretty much every nation including India. The potential arrangements are to utilize either synthetic properties of the currency or to utilize its physical appearance. The methodology displayed in this paper depends on physical appearance of the Indian currency. Picture preparing calculations have been received to remove the highlights, for example, security string, intaglio printing (RBI logo) and distinguishing proof imprint, which have been embraced as security highlights of Indian currency. To make the system progressively powerful and precise, the conclusive score of all the three highlights has been intertwined to separate among genuine and fake monetary standards. The fake currency discovery precision of the proposed system is 100%. Another parameter used to quantify the presentation of the proposed system is mean square blunder, which is roughly 1%. It might be received by the average citizens too, who regularly face the issue of separating among genuine and fake monetary standards.

## I. INTRODUCTION:

Monetary advancement of each country is generally reliant on its currency and each individual is the piece of Economy yet a portion of the unsocial gathering of individuals harm this procedure and unbalances the social concordance of the country. For ex. Presently a days, in procedure of demonetization, there are long lines before banks and ATM Machines of those ordinary citizens who add to our economy by covering regulatory obligations yet then again many debased individuals are giving the cash legitimately by underhandedness sources and it is straightforwardly affecting on monetary status of India. As we probably am aware, in India, Ministry Of Finance and RBI (Reserve Bank Of India are approved to give currency notes and coins. Be that as it may, degenerate individuals exploit high printing and

checking advances to print fake notes by utilizing most recent equipment instruments and procedures. Fake currency identification means finding the fake currency from the first one. By and large, currency acknowledgment system is generally utilized in banks, business firms, shopping centers, railroad stations, government area, associations etc.[1] But average citizens don't have any wellspring of currency location and they can't recognize the genuine unique currency. That is the reason the misbehavior of fake currency is completed straightforwardly in our economy. [2] Till date, numerous analysts have given their commitment in finding the strategy of distinguishing the veritable currency notes from the fake notes.

## II. LITERATURE SURVEY

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. Paper money came inexistence in 1200s in China using the wood of mulberry trees was used to make money. 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. In modern times the problem still prevails and hence the use of different types of printing techniques and inclusion of different types of features in currencies has been happening, aiming to provide an easier way to detect forgeries [2].

But with the advancement of technology and the growth of science new ways to detect counterfeit money are coming up that make this task quite easier with a fair amount of accuracy. Modern techniques include holograms, multi colored stripes, counterfeit pen that contains iodine (which reacts with the starch present in paper money) and the use of UV rays to detect fake currencies [3,4].

But all the new gadgets used nowadays in banks are not accessible to non-experts; hence the problem of detecting fake money remains in the society. In this paper, we put forward an approach that has the potential to act as a layman's tool to detect counterfeit money. The use of digital image processing for this purpose gives us an economical alternative to create a robust counterfeit money detecting system that can benefit the society as a whole. The fake currency detection for Bangladeshi notes based on image processing has been done by Ahmed et. al. [5]. Another approach was proposed by Ogeila et. al. [6] for fake currency detection in electronic currency exchange. The fake currency detection was of profound significance as far as money deposit in an ATM is concerned [7]. Another interesting approach was presented by Santhanam et. al. [8] by including polarization concept and holographic detection methods along with image processing technique. Alshayej et. al. [9] adopted bit-plane slicing approach for fake currency detection. A review of the recent methods for fake currency detection was presented in [10] and can be referred for detailed description. Recently, Lim et. al. [11] presented an approach

named as hyper spectral imaging for currency counterfeit detection. The higher resolution resulted in good performance, but it suffered from the drawback of the slow speed of scanning. The solution to slow speed was provided by Baber et. al. [12] by applying image processing for detecting edges of the paper notes. The edge detection methods were not so reliable, so we have proposed new algorithms for extracting security features. Being inspired from the recent developments in the field of image processing and availability of cheap image acquisition devices, we present an approach for fake currency detection based on image processing. The proposed approach extracts multiple features from Indian currency and uses them for fake currency detection. The outline of the proposed work is presented in Fig.2. The image was acquired using image acquisition device. The security features were extracted using various image processing algorithms and then template matching was done to identify fake currency. The novelty of the presented approach is in image processing applied for extraction of security features from the given images of currency.

### III. CURRENCY FEATURES:

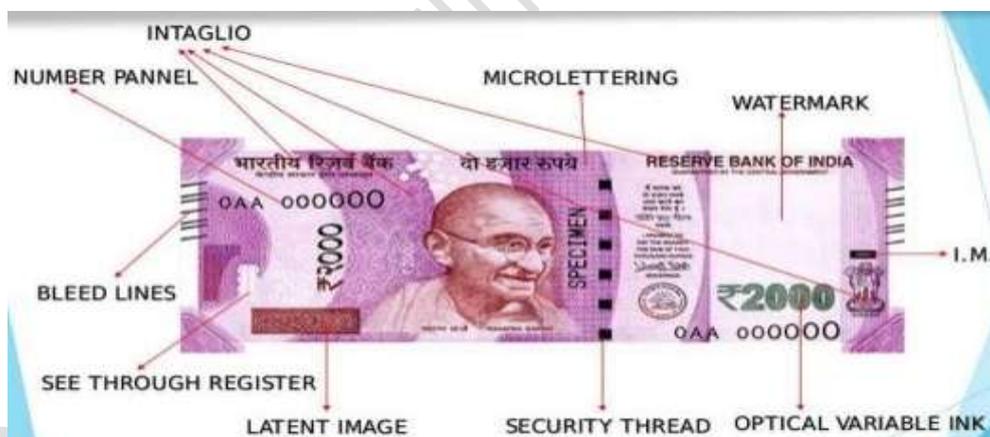


Fig. 1. Security features of Indian Currency

To aware the general public we are publishing some security features of the currency notes so that counterfeit notes can be detected by the general public.

#### 1. Security Thread

The security thread appears to one side of the Mahatma's picture. Security thread has a plain, non-decipherable completely inserted security

thread. In any case, since October 2000, the Rs.2000 notes contain a discernible, windowed security thread then again obvious on the front-side with the engravings 'Bharat' (in Hindi), '2000' and 'RBI'.

All the currency notes have security thread. At the point when notes held against the light, the security thread on Rs.2000, Rs.500 and Rs.100 can be viewed as one continuous line.

## 2. Watermark

The Mahatma Gandhi Series of banknotes contain the Mahatma Gandhi watermark with a light and shade effect and multi-directional lines in the watermark window.

## 3. Micro-Lettering



Fig. 2. Micro lettering

This feature appears between the vertical band and Mahatma Gandhi portrait. It contains the word 'RBI' in Rs.5 and Rs.10. The notes of Rs.20 and above also contain the denominational value of the notes in micro-letters. This feature can be seen well with the help of a magnifying glass.

## 4. Latent Image

On the obverse side of Rs.2000, Rs.500, Rs.100, Rs.50 and Rs.20 notes, a vertical band on the right side of the Mahatma Gandhi's portrait contains a latent image showing the respective denominational value in numeral. The latent image is visible only when the note is held horizontally at eye level.



Fig. 3. Latent Image of 2000 note

## 5. Identification Mark

To help the visually impaired a special feature in intaglio has been introduced on the left of the watermark window on all notes. This feature is in different shapes for various denominations i.e. Rs. 20 have in Vertical Rectangle, Rs.50 in Square, Rs. 100 in Triangle and Rs. 500 in Circle.

## 6. Intaglio Printing

The image marked in the boxes of figure 4 are been printed by intaglio printing i.e. in raised print which can be felt by soft touch. This feature is added in the bank notes for the convenience of the blind peoples. The Ashoka Pillar Emblem on the left, portrait of Mahatma Gandhi, the Reserve Bank seal, guarantee and promise clause, RBI Governor's signature are printed in intaglio.



Fig. 4. Micro lettering

In the Indian currency notes of denominations Rs.20, Rs.50, Rs.100, Rs.500 and Rs.2000 have used this style of printing.

## 7. Optically Variable Ink or Colour-Changing Ink

This is a new security feature incorporated in the Rs.1000 and Rs.500 notes since November 2000. The numeral digit 2000 and 500 on the obverse of Rs.2000 and Rs.500 notes respectively is printed in optically variable ink viz., a colour-changing ink. The colour of the numeral 2000/500 appears green when the note is held flat but would change to blue when the note is held at an angle.

## 8. See through Register

This feature will show up number when the note is held against light.



Fig. 5. Register feature

The small floral design printed both on the front and back of the note in the middle of the vertical band next to the Watermark has an accurate back to back registration.

### 9. Fluorescence

Number panels of the notes are printed in fluorescent ink. The banknotes also have optical fibres. Both can be seen when the notes are in front of ultra-violet lamp.



Fig. 6. Fluorescence

### IV. CONCLUSION

In this paper, an efficient approach is introduced to extract the features of Indian currency notes and recognize it. The paper also contains the fake currency detection and authentication. Our future work will be concentrated on fast and more accurate fake currency detection using advanced image processing techniques. Our future scope will be conversion of currency denomination.

### V. REFERENCES:

[1] Security Features of Indian Banknotes, Available at: [https://www.rbi.org.in/scripts/ic\\_banknotessecurity.aspx](https://www.rbi.org.in/scripts/ic_banknotessecurity.aspx)

[2] D. Alekhya , G. D. S. Prabha, and G. V. D. Rao, "Fake currency detection using image processing

and other standard methods," International Journal of Research in Computer and Communication Technology, vol. 3, no. 1, pp. 128-131, January 2014.

[3] M. Thakur and A. Kaur, "Various fake currency detection techniques," International Journal for Technological Research in Engineering, vol. 1, no. 11, pp. 1309-1313, July 2014.

[4] Y.Q. Meng, "Study design on anti-fake detection method for CNY100. 00 banknote," In Applied Mechanics and Materials, vol. 574, pp. 457-461, August 2014.

[5] Z. Ahmed, Y. Sabina, M. N. Islam, and R. U. Ahmed "Image processing based feature extraction of Bangladeshi banknotes", Software, Knowledge, Information Management and Applications (SKIMA), 8th International Conference on IEEE, pp. 1-8, 2014.

[6] M. R. Ogiela and P. Sulkowski, "Protocol for detection of counterfeit transactions in electronic currency exchange," Cryptography and Security Systems, pp.145-152, Springer Berlin Heidelberg, 2014.

[7] K. Satish, Y. K. Viswanadham, and I. Leela Priya, "Money to ATM—fake currency detection," International Journal of Computer Science and Information Technologies, vol. 3, no.5, pp. 5046-5050, 2012.

[8] K. Santhanam, S. Sairam, V. Sriram, and A. M. Kumarasamy, "Counterfeit currency detection technique using image processing, polarization principle and holographic technique," In Computational Intelligence, Modelling and Simulation, 2013 Fifth International Conference on, pp. 231-235, 2013.

[9] M. H. Alshayegi, M. Al-Rousan, and D. T. Hassoun, "detection method for counterfeit currency based on bit-plane slicing technique," International Journal of Multimedia and Ubiquitous Engineering, vol. 10, no. 11, pp. 225-242, 2015.

[10] A. Shah, K Vora, and J. Mehta, "A review paper on currency recognition system," International Journal of Computer Applications, vol. 115, no. 20, pp. 1-4, 2015.

[11] H.T. Lim and M. V. Matham, "Instrumentation challenges of a pushbroom

hyperspectral imaging system for currency counterfeit applications,” In International Conference on Optical and Photonic Engineering, pp. 95242I-95242I, July 2015.

[12] A. Babar, S. Jawalekar, K. Yadav, and D. B. Salunke, “ Counterfeit currency detector,” International Journal of Technical Research and Applications, vol.3, no. 3, pp. 106-108, May 2015.

[13] B. R. Kavya and B. Devendran, “Indian currency detection and denomination using SIFT,” International Journal of science, Engineering and Technology Research, vol. 4, no. 6, pp. 1909-1911, June 2015.

Journal of Engineering Sciences