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Automatic Indian New Fake Currency Detection Technique

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***Abstract* - In India,' currency' is the means of Transaction so there is more value for currency in our social and economic development. Here, currency exists in the form of coins, banknotes and electronic data. Fake money or counterfeit notes is the dangerous or acute problem in front of whole world, and India is also a part of this fake currency. Modernization in the financial system is a milestone in protecting the economic development and now a days Indian government has become conscious about this so demonetization of Rs 1000 and Rs 500 notes is the latest example of it. But again we have Rs 2000 as a new currency in market. so as the highest value note there is a chance that corrupt people will try to make it as a counterfeit. So main objective of this paper is to study different key features of new genuine currency and use such techniques to detect and verify new currency circulated by Reserve Bank Of India. There are Different techniques which are used to distinguish between counterfeit notes and genuine one. By using different components of Digital Image processing such as image processing, image segmentation, characteristics extraction, comparing images etc. we can extract the features of genuine notes. It is a very challenging task for detecting fake currency.**

General Terms* - *Image Processing, feature extraction, detection.

Keywords* - *Segmenting feature of currency, canny, financial system , genuine note.

I. INTRODUCTION

Economic development of every nation is mostly dependent on its currency and every person is the part of Economy but some of the unsocial group of people damage this process and unbalances the social harmony of the nation. For ex. Now a days, in process of demonetization, there are long queues in front of banks and ATM Machines of those common people who contribute to our economy by paying taxes but on the other hand many corrupted people are issuing the money directly by evil sources and it is directly effecting on economic status of India.

As we know, in India, Ministry Of Finance and RBI(Reserve Bank Of India are authorized to issue currency notes and coins. But corrupt people take the advantage of high printing and scanning technologies to print fake notes by using latest hardware tools and techniques.

Fake currency detection means finding the fake currency from the original one. Generally, currency recognition system is mostly used in banks, business firms, shopping malls, railway stations, government sector, organizations etc.[1] But common people do not have any source of currency detection and they are unable to identify the real original currency. That's why the malpractice of fake currency is carried out openly in our economy. [2]

Till date, many researchers have given their contribution in finding the technique of identifying the genuine currency notes from the fake notes.

II. LITERATURE SURVEY

In 2014, Binod Prasad Yadav, C. S. Patil, R. R. Karhe, P.H Patil [3] presented Detecting fake currency manually it is very default or time-consuming. This process is check by using some technique it is batter to human life that is done by using fature extraction with HSV is nice technique to detect fake currency with his opinion. This process is done by using MATLAB.

B.Sai Prasanthi , D.Rajesh Setty[4] Automated detecting fake currency system can be very help full to banking or other business so many author work on this technology as per his opinion fake currency detection is very important task in human life. India is also one of them. In this article, recognition of paper currency with the help of digital image processing techniques is described. Six characteristics of Indian paper currency are selected for counterfeit detection included identification mark, security thread, watermark, numeral watermark, floral design and micro-lettering. The characteristic feature extraction is performed on the image of the currency and it is compared with the characteristic features of the genuine currency. The decision making is done by calculating the black pixels. This article is aimed to design a low cost system and quick decision making system.

In 2015 Kevya B R, Devendran B [5] they are designing a system that helps in identification of Indian currency notes and to check whether it is a valid or invalid. This is to differentiate between the counterfeit notes and genuine notes. Currency features such as See Througth register, See Through register symbol or Identification mark, Security

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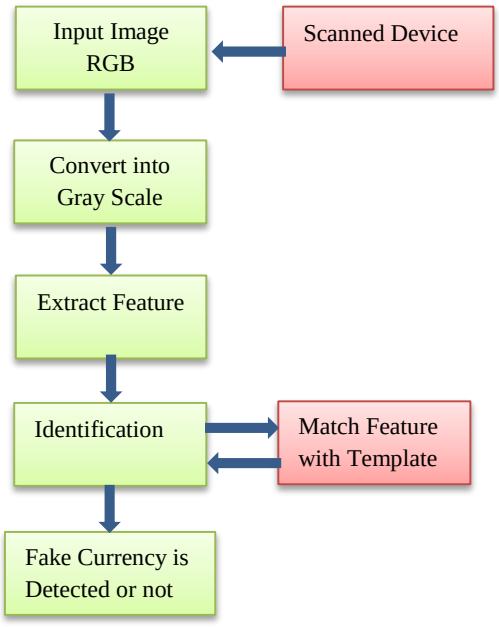
thread, Governer's signature, Microlettering, year of print. This features are segmented using 3x3 grid. This is done by the use of SIFT technique which helps in efficient matching of the features.

In 2016 W. K. El Said [6] they Recently, due to the development in computer software, laser printers and scanners, counterfeiting has become an urgent issue. As a result, distinguishing fake currency from genuine one using new technologies has become more important. This research paper presents a new feature extraction based system for detecting the fake Egyptian paper currency. The process of extracting features is separately performed on both sides of the original and the sample version of the currency image. The obtained features are divided into two parts namely; texture features and shape features. The currency detection decision for each side is independently acquired by similarity measurement. Simulation results show that the proposed system can be used effectively in financial organizations and various commercial applications.

In 2015, Komal Vora, Ami Shah, Jay Mehta [7] they presented The entire system is pre-processed for the optimal and efficient implementation of two dimensional discrete wavelet transform (2D DWT) which is used to develop a currency recognition system. A set of coefficient statistical moments are then extracted from the approximate efficient matrix. The extracted features can be used for recognition, classification and retrieval of currency notes. The classification result will facilitate the recognition of fake currency mainly using serial number extraction by implementing OCR. It is found that the proposed method gives superior results.

III. PROPOSED DESIGN

A Flow of fake Currency detection technique



For example ,we have new Rs 500 and Rs 2000 notes.We will discuss their feature one by one .

First image is of Rs500..

Second image is of Rs 2000.

B Front –side features. (These are the obverse features)

Rs 500 denomination bank notes are released in new series with inset letter ‘E’ in both the number panels and it also has the image of Mahatma Gandhi and signature of Governor Dr. Urjit R.Patel.

First of all we will discuss the features of Rs 500 notes.

Color
The color of Rs 500 note is stone gray.

Size
The new Rs 500 note is smaller than previous note (size of at 63mm x 150 mm).

Bleed lines
There are seven “bleed lines” on the side of Rs.2000 notes, and five lines on Rs 500 notes.

Latent image
In Rs 500 note there is latent image of the denomination in numeral.

Denomination numeral in devnagari font.

Devnagari font is also used on the currency of Rs.500.

Orientation

In previous notes of Rs 500 and current notes there are some changes in orientation and relative position of Mahatma Gandhi..

Windowed security thread

Rs.500 notes contain a readable, fully embedded windowed security thread with the inscription “Bharat‟ (in Hindi), and “RBI‟. Which changes color from green to blue when note is tilted. Guarantee clause, Governor’s signature with promise clause and RBI emblem shifted towards right.

Portrait

The portrait has been changed in raised manner. The orientation and the portrait of Mahatma Gandhi has been changed and we can see the electrotype watermark also.

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Numerals
In new currency notes numerals are mentioned in the increasing order of their size from top-left side to bottom-right side.

Ashoka pillar emblem

On the right side Ashoka pillar emblem is present.

Special Features of New Currency

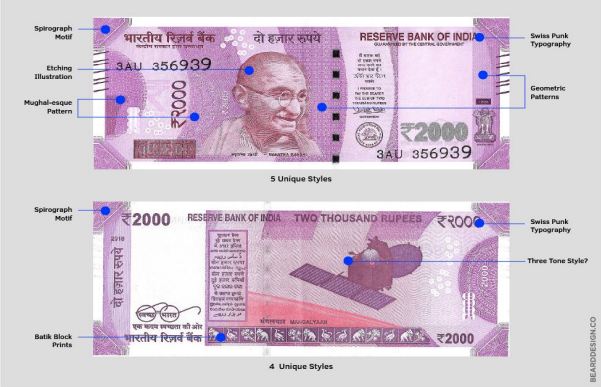
1. Swachh Bharat slogan with logo.

2.At the center there is a language panel.

3.Red fort with Indian tri-color(flag)

4.At the right side denomination numeral in Devnagri

C key features of Rs 2000 notes.



Due to no of complaints about "counterfeit notes of Rs.2000 denomination, common people are worried about its circulation.. There are different key features of genuine notes. The touch and appearance of it makes it different .It has geometric patterns aligning with the overall color scheme, both of the obverse and reverse side.

Color
New banknotes of Rs 2000 are color changing notes. Paper color is magenta.
Size

The size of this note is 66mm x 166 mm.

See through register-
In old notes the denomination's numeral was written in the middle or at the Centre. Whereas in the new currency note it is mentioned on the left hand side

Latent image
On the obverse side of Rs. 2000 and Rs. 500, when the note is tilted at 45 degree , latent image of denominational value in numerical manner is displayed. When we hold the note at an angel of 450 or When note is held against light the numeral 2,000 can be seen very clearly and Color is changed from green to blue.

Watermarks
We can see the watermark of Mahatma Gandhi and 2,000 numeral in the new currency note. .The portrait of Mahatma Gandhiji is displayed in raised manner as compared to the previous currency notes.

Windowed security thread
There are three names that are present on the security thread i.e Bharat, RBI and 2000 printed in raised manner with shift in their colors when held at different angles . Because of this special feature visually challenged people can easily identify the notes.
Number panel

Number panel with numerals growing from small to big on top left and bottom right sides

These are the front side features, now let's discuss about the reverse side features.

Reverse side features

1) 'Swachh Bharat logo with slogan ' –
Swachh bharat logo is placed on spectacle with slogan "Ek kadam swachhta ki aur" it is the part of Narendra modi's "Swachh Bharat Abhiyaan".

2) The Symbol of Mangalyan-
We have a new feature in this new note that is the symbol of Mangalyan. It was a rumor in people's mind that GPS chip is embedded in this new currency that can easily find the location of notes. But GPS chip is not inserted in it. It is the part of Mar's mission of India and after that India got place in interplanetary domain.
3) Orientation of Mahatma Gandhi
Orientation and size of portrait of Gandhiji has been changed and placed in raised manner.
4) number panel
In the current note Top left and bottom right side number panel with numerals is there ,which is increasing from smaller to bigger form.

IV. 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 analyses 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 of the image. The Flowchart of the steps involved in methodology is as follows:

Fig-1:Flow-chart of methodology
Image Acquisition (Input Image)
In this process first input the image by using optical scanner or directly photography. We can read the image by using different source it is software based or hardware based source. When we perform the operation on any verification we should go with image processing technology. Without image we cannot perform any operation. Extraction and detection is very important part in any verification.

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Image pre-processing:-
Image pre- processing is used to extract the feature from images and perform different operation for any document verification.

Image adjusting:-
When we produce the image by scanner or any digital devices the image size is so bigger but when we perform operation on image we should reduce the size of image then we perform the different operation on image. And this task is perform by using adjust function in MATLAB. It is better software to perform the operation on image.

Image smoothening:-
In this process we can capture the image by using digital camera or scan the image by using scanner, and then some noise will appear on the image. Firstly we should have to remove that noise. It is very important task for feature extraction and detection in the image processing technology.

iii) Median filter:-
When we process the image we should apply some filtering technique. To filter the image so may author is used different technique to filter the image for the operation.

Image Binarization
Document image binarization is usually performed in the pre-processing stage of different document image processing related applications such as optical character recognition (OCR) and document image retrieval. A gray-scale document image is converted into a binary document image and accordingly it facilitates the ensuing tasks such as document skew estimation and document layout analysis. As more and more text documents are scanned, fast and accurate document image binarization is becoming increasingly important.

Image Segmentation
It determines region boundaries in an image. It can explore many different approches to an image sengmentation & thresholding. Optimal Global Thresholding:

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

Histogram is bimodal (object and background)

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

Feature Extraction
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 analysis 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. Some of the features of Indian paper currency are stated as below:- Identification marks[3]:

V. IMAGE DATABASE

This paper will generate its own data base that is related to new currency of Indian economy.

VI. CONCLUSION

At present we are having Rs 2000 as the highest value currency in India so in upcoming years there is a chance of scamp and duplication of new currency. So we have to develop such a module, which can automatically detect the original currency and easily we can differentiate between counterfeit notes and genuine notes.

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