

## Fake Indian Currency Detection: A Review

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### Abstract

This paper displays the different fake currency detection procedures. Fake currency is impersonation currency created without the lawful authorize of the state or government. Delivering or utilizing fake currency is a type of misrepresentation or fraud. In the course of recent years, because of the immense innovative advances in shading printing, copying and examining, falsifying issues have turned out to be increasingly genuine. Hence the issue of proficiently recognizing fake banknotes from honest to goodness ones by means of programmed Fake currency detection system has turned out to be increasingly vital. Fake currency detection system can be utilized as a part of spots, for example, shops, banks counter and computerized teller machine, auto merchant machines and so on. We have looked into changed fake currency detection systems. The systems are created utilizing diverse techniques and algorithms. The advantages of this examination for the peruser are that this investigation will give data about the distinctive strategies and algorithms utilized for fake currency detection system. They can look at the detection systems. Detection capacity relies upon the currency note characteristics of specific nation and extraction of highlights.

**Key Words:** Fake currency, Digital image processing, counterfeit detection.

## 1 INTRODUCTION

Fake currency is impersonation currency created without the lawful authorize of the state or government. Delivering or utilizing Fake currency is a type of extortion or fraud. Counterfeiting is nearly as old as cash itself. Prior to the presentation of paper cash, the most pervasive strategy for counterfeiting included blending base metals with unadulterated gold or silver. A type of counterfeiting is the generation of reports by genuine printers in light of fake directions. A portion of the evil impacts that fake cash has on society incorporate a diminishment in the estimation of genuine cash; and increment in costs because of more cash getting circled in the economy-an unapproved fake increment in the cash supply; a decline in the agreeableness of paper cash; and misfortunes, when merchants are not repaid for fake cash recognized by banks, regardless of whether it is reallocated. As per figures revealed in Parliament, amid the 2006-09, 7.34 lakh of Rs 100 notes, 5.76 lakh of Rs 500 notes and 1.09 lakh of Rs 1000 notes, all fakes, have been seized. The quantity of fake notes per million have expanded from 4.4 out of 2007-08 to 7.51 of every 2011-12. For higher named notes (Rs 500 and

Rs 1000) the expansion was twofold: from 9.7 out of 200708 to 18.2 out of 2011-12. This is viewed as just as a “glimpse of a larger problem” when contrasted with the aggregate unseized notes in the Indian market. The Nayak Committee, named to evaluate the danger of fake currency, puts the aggregate sum of fake currency available for use in India at about Rs 1,69,000 crore starting at 2000 (as it were, eight for each million were fake). The extent of the issue, in this way, is enormous [15]. To recognize fake and genuine currency notes has turned out to be progressively troublesome for the most part because of the way that fakes are presently printed with best in class innovation utilizing security paper [15]. Because of incredible innovative headway counterfeiting issues have turned out to be increasingly genuine. Thusly the issue of effectively recognizing fake banknotes from honest to goodness ones by means of programmed machines has turned out to be increasingly imperative [9]. The fake currency detection system is created to distinguish the fake currency by applying diverse strategies and techniques on currency note. The fake currency detection system ought to have

the capacity to perceive the note rapidly and accurately. The fake currency detection system ought to have the capacity to perceive currency note from any side. Currency acknowledgment system can be utilized as a part of spots, for example, shops, banks counter and robotized teller machine, auto vender machines and so forth [12]. We have assessed diverse fake currency detection systems. The systems are produced utilizing diverse strategies and algorithms. The advantages of this investigation for the peruser are that this examination will give data about the distinctive strategies and algorithms utilized for fake currency detection system. They can look at the detection systems. Detection capacity relies upon the currency note characteristics of specific nation and extraction of highlights [11].

## 2 DIFFERENT FAKE CURRENCY DETECTION TECHNIQUES

### A. Commonly Used Methods to Detect Fake Currency

#### 1. See through Register

The little flower configuration printed both on the front (empty) and back (topped off) of the note amidst the vertical band alongside the Watermark has an exact consecutive enlistment. The outline will show up as botanical plan when seen against the light.

#### 2. Water marking

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

#### 3. Fluorescence

Number boards of the notes are imprinted in fluorescent ink. The notes likewise have optical strands. Both can be seen when the notes are presented to ultra-violet light.

#### 4. Security Thread

The Rs.500 and Rs.100 notes have a security thread with comparative unmistakable highlights and engraving Bharat (in Hindi), and RBI. At the point when held against the light, the security thread on Rs.1000, Rs.500 and Rs.100 can be seen as one persistent line. The Rs.5, Rs.10, Rs.20 and Rs.50 notes contain a discernable, completely inserted windowed security thread with the engraving Bharat (in Hindi), and RBI. The security thread appears to one

side of the Mahatma's picture.



Fig.1 Original 2000 Rupee Note Features

## 2. Intaglio Printing

The representation of Mahatma Gandhi, the Reserve Bank seal, certification and guarantee proviso, Ashoka Pillar Emblem on the left, RBI Governor's mark are imprinted in intaglio i.e. in raised prints, which can be felt by touch, in Rs.20, Rs.50, Rs.100, Rs.500 and Rs.1000 notes.

## 3. Latent picture

On the front side of Rs.1000, Rs.500, Rs.100, Rs.50 and Rs.20 takes note of, a vertical band on the correct side of the Mahatma Gandhis picture contains an idle picture demonstrating the separate denominational incentive in numeral. The inactive picture is obvious just when the note is held on a level plane at eye level.

## 4. Micro lettering

This component shows up between the vertical band and Mahatma Gandhi picture. It generally contains the word RBI in Rs.5 and Rs.10. The notes of Rs.20 or more likewise contain the denominational estimation of the notes in smaller scale letters. This element can be seen well under an amplifying glass.

## 5. Identification Mark

Each note has a remarkable sign of it. An extraordinary element in intaglio has been presented on the left of the watermark window on all notes aside from Rs.10/- note. This component is in various shapes for different divisions (Rs. 20-Vertical Rectangle, Rs.50-Square, Rs.100-Triangle, Rs.500-Circle, and Rs.1000-Diamond) and causes the outwardly disabled to distinguish the category.

#### 6. Optically Variable Ink

This is another component incorporated into the Rs.1000 and Rs.500 notes with updated shading plan presented in November 2000. The numeral 1000 and 500 on the front-side of Rs.1000 and Rs.500 notes separately is imprinted in optically factor ink viz., a shading moving ink. The shade of the numeral 1000/500 seems green when the note is held level however would change to blue when the note is held at a point..

#### B. Digital Image Processing Method To Detect Fake Currency

The outline stream of fake currency detection system incorporates eight phases: Image obtaining, pre-preparing, dim scale transformation, edge detection, picture division, highlight extraction, examination and yield [11]. This system is chips away at two pictures, one is test currency picture on which validation is to performed and other is the first currency picture.

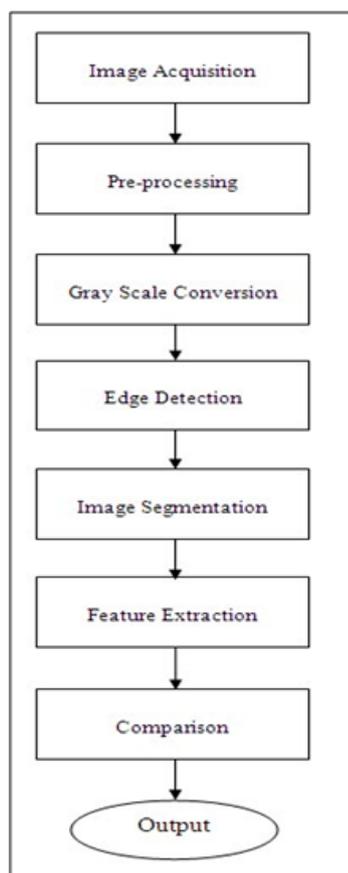


Fig.2 Flow Chart of Digital Image Processing Method To Detect Fake Notes

1. Image Acquisition

There are different approaches to procure image, for example, with the assistance of camera or scanner. Obtained image ought to hold every one of the features [11].

2. Pre-Processing

Pre-processing of image are those tasks that are regularly required before the principle information examination and extraction of data. The point of image pre-processing is to suppress undesired mutilations or upgrade some image features that are essential for additionally processing or examination.

It incorporates

#### 2.1 Image Adjusting

When we get the image from a scanner, the span of the image is so huge. So as to diminish the figuring, we diminish the span of image. Image Adjusting is finished with the assistance of image addition. Introduction is the strategy generally utilized for assignments, for example, zooming, pivoting, contracting, and for geometric rectifications.

#### 2.2 Image smoothening

When utilizing a camera or a scanner and perform image exchanges, some clamor will show up on the image. Image commotion is the irregular variety of brilliance in images. Evacuating the clamor is an imperative advance when image processing is being performed. However clamor may influence segmentation and example coordinating. When performing smoothing process on a pixel, the neighbor of the pixel is utilized to do some changing. After that another estimation of the pixel is made. The neighbor of the pixel is comprising with some different pixels and they develop a lattice, the span of the grid is odd number, the objective pixel is situated on the center of the framework. Convolution is utilized to perform image smoothing. Likewise image smoothening should be possible with the assistance of middle channel which more viable than convolution when objective is to at the same time diminish the clamor preserving edges. Middle channel replaces a pixel by means of the middle pixel of the considerable number of neighborhoods [11].

#### 3. Gray-scale conversion:

The image gained is in RGB shading. It is changed over into gray scale since it conveys just the force data which is anything but difficult to process as opposed to processing three segments R (Red), G(Green), B(Blue) [7].

#### 4. Edge detection

Edge detection is a key instrument in image processing and PC vision, especially in the territories of feature detection and feature extraction, which go for distinguishing focuses in an advanced image at which the image splendor changes strongly or, all the more formally, has discontinuities. Edge detection is one of the crucial strides in image processing, image examination, image design acknowledgment, and PC vision methods[9].

#### 5. Image segmentation

Image segmentation sub isolates the image into its constituent areas or articles.

In the principal class, the approach is to segment an image in view of unexpected changes in power, for example, edges in an image. The approach in the second classification depends on dividing an image into districts that are comparable as indicated by an arrangement of predefined criteria [9].

#### 6. Feature Extraction

In design acknowledgment and in image processing, feature extraction is the unique type of dimensionality diminishment. It is the strategy for catching the visual substance of images for ordering and recovery. At the point when the information to a calculation is too substantial to be in any way prepared and it is suspected to be famously repetitive (much information however very little data) at that point the info information will be changed into a lessened representation set of features (additionally named feature vector). In the event that the properties removed are deliberately picked, it is normal that the qualities set will extricate the significant data from the info information with a specific end goal to play out the coveted assignment utilizing this lessened representation rather than the full size info. Feature extraction includes streamlining the measure of assets required to portray the expansive arrangement of information.

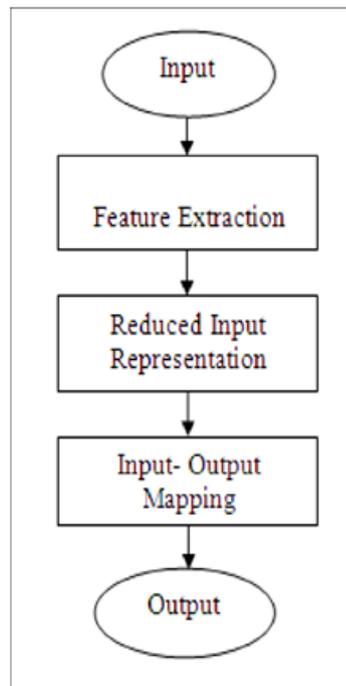


Fig.3 Feature Extraction Approach

Visual attributes of images are of two types- Domain specific attributes which include fingerprints, human faces. General attributes which include color, texture, and shape.

There are two types of attributes categorized under the shape attribute extraction- Global attributes include moment invariant, aspect ratio and circularity. Local attributes include boundary segments [7].

1. Comparison Lastly the extracted features of test currency image are compared with the extracted features of original currency image, if it matches then the currency is original otherwise fake [7].

C. MATLAB technique: In this technique one can split the red, blue, green components of a picture and name them as  $r_1$ ,  $g_1$ ,  $b_1$  which correspond to image i.e. original currency note. Consider second image that is note to be tested. Split this image to components  $r_2$ ,  $b_2$ ,  $g_2$ . Construct a new image with components as  $r_1$ ,  $g_2$ ,  $b_1$  or  $r_2$ ,  $g_1$ ,  $b_1$  or  $b_2$ ,  $g_1$ ,  $b_1$ . But  $r_1, g_2, b_1$  combination is

most preferred because human eye is sensitive to green component and most of our images contains maximum green component so that our output image will be much easier to identify the fake note more efficiently. After that compare newly constructed image with image1. Calculate the threshold value of equivalence by calculating the standard deviation. If equivalence is above 40% then one can consider it as original note. Here consider 40% value because note may be damaged. Parameters for measure of comparing images are Mean Square Error (MSE), Peak Signal to Noise Ratio (PSNR in dB), and structural Content (SC). When combine two various components of two images then if note to be tested is original then only at the place of number we get variation. But in case of fake note after applying the same code, one can observe that the image overlapping is not done correctly. One can also see that the resultant image is blurred indicating fake note. So one can confirm that it is a fake note [6].

D. Counterfeit Detection Pen: A counterfeit pen is simply an inexpensive device that is designed to determine if a currency note is original or fake. The pen contains a tincture of iodine as ink which, when drawn over a note, will remain amber or brown. According to one manufacturer the ink will turn black if the note is fake.

1. Working of counterfeit pen: The iodine in the pen reacts with starch, which is the primary component that makes white paper look brighter. Most commercial paper, made from wood pulp, is brown unless bleached and starched. If there is no starch present in the paper then the pen will indicate - by remaining amber- that the note is original. 2. How counterfeiters defeat this pen: The iodine in the pen reacts with starch that makes white paper look brighter. Most unless bleached and starched. If there is no starch present in the paper then the pen will indicate by remaining amber - that the note is original [6].

E. Other techniques: The other anti-counterfeit device for the money is an Ultraviolet counterfeit detection scanner. Best used in highly lit point of sale locations, the UV detector identifies the ultraviolet security features present in most currencies. By simply placing the note in the detector, counterfeit currency is immediately identified, without the need for an employee to closely examine the note [6].

### 3 CONCLUSION

In this investigation, we talked about different fake currency detection strategies, everyone has its own centrality. By utilizing said techniques we have watch that great outcomes can be gotten rapidly and effectively. The advantages of this examination for the peruser are that this investigation will give data about the distinctive techniques and algorithms utilized for fake currency detection system. They can look at the detection systems.

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