



## Fake Currency Detection Using Image Processing

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### ABSTRACT

The technology used for currency recognition primarily aims for extracting visible and invisible characteristics of the currency notes. Until now, many techniques are planned to identify the currency note. However, the foremost effective approach is to use the visible choices of the note. For example, color and size. However, this way is not helpful if the note is dirty or torn. If a note is dirty, its color characteristic is changed wide. So, it is vital that but, we tend to tend to extract the choices of the image of the currency note and apply the right formula to reinforce accuracy to acknowledge the note. We tend to use here a simple formula that works properly.

**Keywords:** currency, detection, color, scaling, extraction.

### I. INTRODUCTION

Counterfeit notes are one in every of the largest issues occurring in money transactions. For a rustic like Republic of India, it is become huge hurdle. Because of the advances in printing, scanning technology it's simply doable for some- one to print faux notes with use of latest hardware tools. The circulation of counterfeit currency affects several economies by inflicting inflation and money losses whenever traders and organizations aren't reimbursed by banks for the counterfeit cash they receive. Different negative effects counterfeiting has on society embody reduction within the worth of real cash and inflation, wherever there's associate unauthorized artificial increase in cash in hand. Even supposing technology has greatly advanced within the last decade more or less, overcoming the creation of counterfeit currency "re- mains a remote future". Currency examiners have to be compelled to level up to the talents of counterfeiters who appear to be continued to travel down the road of counterfeit production. So as to regulate and minimize the flow of counterfeit currency in economies, software system coping with currency notes recognition is employed. In request machines, the detection of counterfeit currency notes is one in every of the foremost crucial tasks performed by the machines, wherever a strong, reliable, and high process technique is needed to mechanically acknowledge counterfeit from authentic currency.

As [2], mentioned within the previous section, some security measures in currency notes are visible and should be detected simply by the essential human senses, like color and size of the notes. However, this technique is restricted by the actual fact that the standard of banknotes is deteriorates over time, and such options might not be detectable by then. Aside from sporting out and obtaining broken, some currency notes have terribly complicated styles that impose some extent of problem once processed with automatic currency recognition. Driven by the issues declared on top of, an easy and economical approach is projected during this paper to satisfy the specified speed and accuracy needs in detective work counterfeit currency notes.



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

#### 1) See Through Register

The [3] small floral style is written within the middle of the vertical band and next to watermark. The floral designed on the front is hollow and in back is crammed up. The floral style has back to back registration. {the style, the planning the look} can see collectively floral design once seen against the sunshine.

#### 2) Watermarking

The Mahatma Gandhi watermark is gift on the bank notes. The sage Gandhi watermark is with the shade result and multidirectional lines in watermark.

#### 3) Optically Variable Ink

Optically variable ink is employed for security feature; this kind of feature is within the Rs.1000 and Rs.500 bank note. Optically variable ink as security feature for bank note is introduced in Gregorian calendar month.2000. The denomination worth is written with the assistance of optical variable ink. the color of numerical one thousand or five hundred seem inexperienced, once note is flat however amendment the color to blue once is control in associate angle.

#### 4) Light

Fluorescent ink is employed to print range panels of the 1 notes., The note conjointly contains glass fiber. the quantity panel in fluorescent ink and glass fiber is seen once ex- posed to light-weight ultraviolet illumination [UV] actinic radiation [actinic ray} light.

#### 5) Security Thread

The [4] security thread is in one thousand and five hundred notes, that seems on the left of the sage Gandhi's portrait. In security thread the visible feature of "RBI" and "BHARAT". once note is control against the sunshine, the safety thread is seen collectively continuous line.

#### 6) Latent Image

The latent image shows the individual denomination worth in numerical. On the observe aspect of notes, the latent image is gift on the correct aspect of Mahatma Gandhi portrait on vertical band. once the note is control horizontally at eye level then the latent image is visible

#### 7) Small inscription

The small letters seem in between the portrait of Mahatma Gandhi and vertical band. small letters contain the denomination worth of bank note in small letters. The denomination worth is seen well underneath simple microscope.

#### 8) Identification

Mark every note has its special identification mark. There are completely different shapes of identification mark for different denomination (Rs.100-Triangle, Rs.500-circle and Rs.1000- Diamond). The identification mark is gift on the left of water mark.

## II. RELATED WORK

Over [1] the years loads of researches are tired this field of Currency note recognition. The authors have done recognition supported Color, texture, security measures etc. There are several systems existing for recognition of faux Indian currency exploitation completely different technique. several of the system uses varied steps like image acquisition, feature extraction and system exploitation varied formula. There is alternative faux currency detection technique follows:

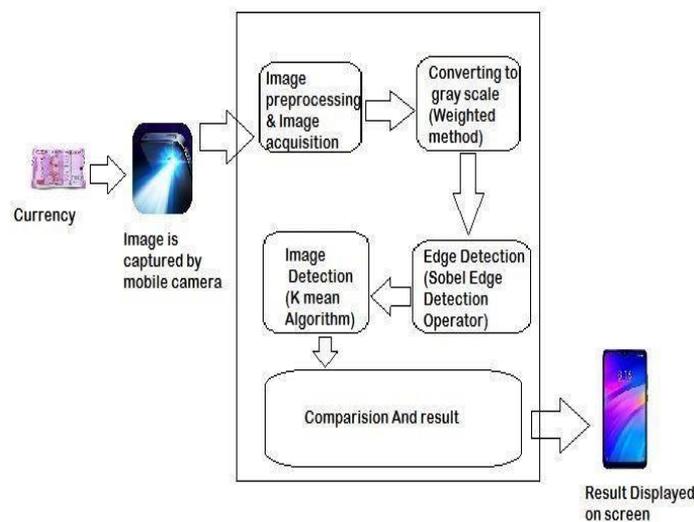
- i) Commonly Used ways to notice faux Currency
- ii) Digital Image process methodology to notice faux Currency

- iii) MATLAB technique
- iv) Counterfeit Detection Pen
- v) Ultraviolet counterfeit detection scanner.

In comparative to their existing system in our planned system we tend to uses the camera for image acquisition, conveyor unit and automatic sorting unit. largely all alternative existing system uses scanner for image acquisition. within the planned system Principal Component Analysis (PCA) is employed for recognition. The pro- posed system consisted of:

- i) Dataset Preparation ii) Feature Extraction iii) Principal part Analysis.

### III. PROPOSED SYSTEM



#### A. Methodology:

1) Image acquisition: Image acquisition in image process is generally outlined because the action of retrieving a picture from some supply, sometimes it's a hardware- based supply, therefore it is more experienced no matter processes ought to occur later on. acting image acquisition within the method of image process is often the primary step within the progress sequence as a result of, while not a picture, no process is feasible. The image is unbroken underneath UV and also the image is captured through an easy camera.

2) Image preprocessing: Image pre-processing is completed to strengthen or intensify a number of the options of image necessary for future analysis and process. It involves operations needed before information analysis and data ex- traction. Here image resizing is completed.

3) Gray scale conversion and edge detection: The no inheritable image is obtained as RGB image that is currently regenerate into grey scale image since it carries intensity data. Image is then regenerate into Grayscale as Image process uses the idea of comparison sections in a picture. this is of- ten computationally a lot of complicated. Intensity information is sometimes sufficient. Grayscale (i.e. intensity) is sometimes sufficient to differentiate edges. As seen here, process color is complicated, and Grayscale provides a straightforward resolution. The arduous half is guaranteeing correct calculations This image is additional processed and edges of grey scale pictures square measure detected.

4) Image segmentation: It's the method of dividing image into multiple elements by cropping it.

5) Feature extraction: currently the options square measure extracted victimization edge based mostly segmentation. Feature extraction a kind of spatiality reduction that with efficiency represents attention-grabbing elements of pictures as a compact feature vector. This approach is helpful once image sizes square measure



giant and a reduced feature illustration is needed to quickly complete tasks like image matching and retrieval. Some options of a picture are: Size or space. each denomination differs from one another within the size parameter. thus, size is used as a feature for currency recognition. However, the most important limitation of this feature is that the scale of the image varies counting on the space from that icon of the image has been taken. to beat this drawback a replacement parameter named ratio was accustomed classify the denominations.

In fact, it's the comparison of the options that allows North American country to differentiate pretend notes from the important ones. to match the performance, we've divided the image then we have a tendency to take away from a binary image all connected elements (objects) that have fewer than P pixels, manufacturing another binary image. The on top of step is perennial thrice to urge the binary image which might be compared. Then we have a tendency to compare the 2 pictures and store the difference.

### B. Algorithms: -

a) For Grayscale Conversion Previous version of this project has used Average technique. we've seen the issues that occur within the average technique. Weighted technique incorporates a resolution to it drawback. Since red color has a lot of wavelength of all the 3 colors, and inexperienced is that the color that has not solely less wavelength then red color however additionally inexperienced that the color that offers a lot of soothing result to the eyes. It implies that we've to decrease the contribution of red color, and increase the contribution of the inexperienced color, and place blue color contribution in between these two. A quite common operator for doing this is often a Sobel Operator, that is associate approximation to a spinoff of a picture. it's separate within the y and x directions. If we glance at the x-direction, the gradient of a picture within the x-direction is capable this operator here. we have a tendency to use a kernel three by three matrix, one for every x and y direction. The gradient for x-direction has minus numbers on the minus facet and positive numbers on the proper hand facet and that we square measure conserving a touch little bit of the middle pixels. Similarly, the gradient for y-direction has minus numbers on rock bottom and positive numbers on prime and here we have a tendency to square measure conserving a touch bit on the center row pixels.

b) A quite common operator for doing this is often a Sobel Operator technique, that is associate approximation a spinoff of a pictures. it's separate within the y and x directions. If we glance at the x-direction, the gradient of a picture within the x-direction is capable this operator here. we have a tendency to use a kernel three by three matrix, one for every x and y direction. The gradient for x-direction has minus numbers on the minus facet and positive numbers on the proper hand facet and that we square measure conserving a touch little bit of the middle pixels. Similarly, the gradient for y-direction has minus numbers on rock bottom and positive numbers on prime and here we have a tendency to square measure conserving a touch bit on the center row pixels.

c) K means that algorithmic rule is associate unvaried algorithmic rule that tries to partition the dataset into Kpre out-lined distinct non-overlapping subgroups (clusters) wherever every information belongs to only 1 cluster. It tries to create the inter-cluster information points as similar as attainable whereas additionally keeping the clusters as totally different (far) as attainable. It assigns information points to a cluster such the ad of the square distance between the information points and also the cluster's center of mass (arithmetic means of all the information points that belong to it cluster) is at the minimum. The less variation we've at intervals clusters, a lot of uniform (similar) the information points square measure at intervals an equivalent cluster.

IV. FIGURES AND TABLES

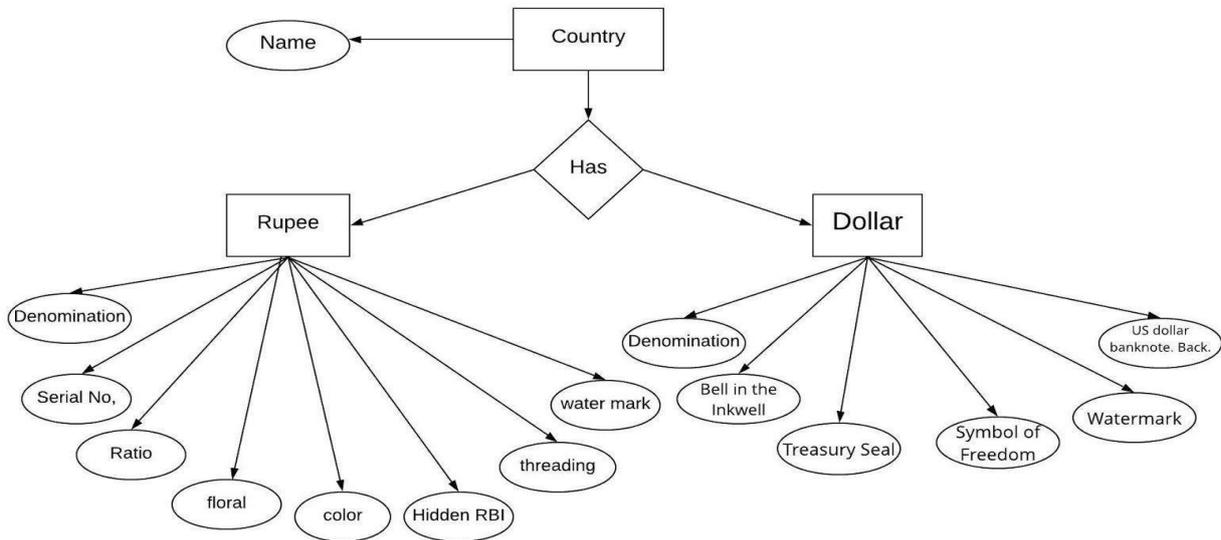


Fig. ER diagram for fake currency detection

Table:

Table Name	Column Name	Data type
Rupee	Denomination	Integer
	Serial No.	BLOB
	Ratio	BLOB
	Floral	BLOB
	Color	BLOB
	Hidden RBI	BLOB
	Threading	BLOB
	Watermark	BLOB
Dollar	Denomination	Integer
	Security Thread	BLOB
	Bell in the Inkwell	BLOB
	Treasury Seal	BLOB
	Symbol of Freedom	BLOB
	Watermark	BLOB

V. RESULTS

The performance of the proposed algorithm is evaluated on the Indian paper currency system. Using the proposed classification algorithm, the banknotes are classified according to denomination with 100% success rate. The expected parameter values for each denomination have been summarized. The parameters

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with the most influence on denomination classification are length, width, aspect ratio, hue, pixel intensity and intensity standard deviation. By comparing the values of the input to the reference values, the denomination with the highest amount of significant similarity is selected. These reference values, specific to the resolution of the camera used, can be easily modified to suit other cameras. The various security features for each denomination were analyzed and the expected values for real notes. If the values of the input note do not match with the expected value of real notes, the note is determined to be counterfeit. Using this algorithm, the success rate of counterfeit identification is 90%.

## VI. CONCLUSION

The increase in printing technology has redoubled faux currency within the market. Our system can facilitate discover the faux currency in real time with ninetieth accuracy with the presence of actinic ray lightweight and 60%-70% accuracy while not actinic ray lightweight. this can facilitate the individual to use it on the daily and can't be cheated on simply. The banks are going to be benefited by reduction within the circulation of faux notes. This all advantages can indirectly profit the economy

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