

# Review on Counterfeit Indian Paper Currency Recognition System

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## ABSTRACT

Paper currency identification is one of the image processing techniques i.e. clothed to recognize currency of different countries. The paper currencies of different countries are collectively rises ever more. However, the main intention of most of the standard currency recognition systems and machines is on recognizing fake currencies. The features are extracted by using image processing toolbox in MATLAB and preprocessed by reducing the data size in captured image. The expose pluck out is discharged by considering HSV (Hue Saturation Value). The chief is neural network classifier and the next step is recognition. MATLAB is used to evolve this program. The new source of paper currency recognition is pattern recognition. But for currency recognition, converter system is an image processing method which is used to identify currency and transfer it into the other currencies as the users need. The need of currency recognition and converters is accurately to recognize the currencies and transfer the currency immediately into the other currency. This application uses the computing energy in differentiation among different kinds of currencies are differentiated with their suitable class using power computing. Fake note at present plays a key topic for the researchers. The recognition system is composed of two parts. First is the captured image and the second is recognition. Forged currencies recognition is the main aim of the standard paper currency identification system. The most mandatory system is currency identification system and it should be very accurate. The performance of different methods are surveyed to refine the exactness of currency recognition system.

**Keywords :** RTC, RFID, IoT, I-Home Health Care.

## I. INTRODUCTION

Peculiarity of the monetary system is a milestone in defensive economic affluence, and maintaining social deal. All over the world there are about more than 140 currencies, a piece of them looking totally antagonistic. The two leading factors are the rapidity and accuracy of processing in this system. Paper money recognition systems need to be skillful to admit banknotes from both sides and every direction. Since banknotes are also faulty throughout turn, the designed system needs to have a resolving exactness in police inquiry ragged or worn banknotes. The best means is to form use of the visible options of the paper money, for precedential, the dimensions and color of the paper money. Until now, for paper money recognition there is a unit several ways planned. Travelling people constantly take many countries of paper currency. For conventional paper currency recognition systems it is a challenge. For practical businesses it is not enough. Computer

perspective is a process of using a computer to wrest high level tidings from a digital image.

Signal processing is any form of image processing for which the input is an image, such as frames of video or photographs. Image processing generally refers to digital image processing, but analog and optical image processing are also probable. A stimulated neural network (SNN), also known as an artificial neural network (ANN) or popularly just neural network (NN) is an interconnected quantum of artificial neurons that uses a computational or mathematical pattern for data processing based on a correlate approach to computation.

Manual trial of all notes in an avocation is huge whilom consuming, clumsy process and also there is a chance of tearing or scratching while handing notes. It is becoming big hurdle, for country like India. Instead, if the banker uses this system, the output could be huge

prim. Same is the occurrence with extent such as investment firms, shopping malls where such systems can be applied. Instant ought is to make an easier way to identify the currency notes.

## II. METHODS AND MATERIAL

### Literature Survey

A diversity of researchers are put forward a numbers of techniques in order to appraise the control of art. In this, the primary principal is on currency detection system which including various strides like image possession, categorization system and feature pull out uses various algorithm [6]. The classification result facilitates recognition of the forged currency can be recognized by mainly using serial number fish out by carrying on optical character recognition (OCR). Image segmentation, edge detection, image processing, comparing images, characteristics extraction are some of the components in this approach [7]. On the image of currency the characteristic extraction is performed and compared with the characteristics of the bonafide currency.

#### A. Pattern Recognition Techniques:

Now a days, banknote admiring more urgent problem because of new and improved uses of fake. Therefore we have gone through some literatures. YingLi Ti an et. Al. developed a novel camera-based computer vision technology to automatically identify banknotes for helping visually impaired people. The overall approach is designed using Image processing and pattern recognition techniques [1]. For detecting fake currencies the embedded security aspects is thoroughly analyzed. Real samples are used in the experiments that show a high-precision machine can be developed for certification of paper money. For both accuracy and processing speed the system performance is reported. The analysis of security features to prevent fake highlights some of the problems that should be considered in designing of currency notes in the future [2]. It is becoming big hurdle for country like India. Because of the advances in printing, scanning technologies it is easy to print fake notes with use of latest hardware tools. Detecting fake notes is a time-consuming and untidy process hence there is need of automation techniques with which currency recognition process can be efficiently done. With the use of

MATLAB many techniques have been proposed, feature extraction with HSV color space and other applications of image processing. With MATLAB algorithm we have implemented a fake note detection unit. This results shows that system has 100% recognition ability on properly captured images.

#### B. Ensemble Neural Networks:

In [3], author has proposed a banknote recognition system composed of two parts; a classification part and a validation part. Few authors presented a currency recognition system using ensemble neural network (ENN). The individual neural networks (NNs) are trained via negative correlation learning. The objective of using negative correlation learning (NCL) is to skill the individuals on different parts. The image of different types of note is converted in gray scale and compressed in the desired range. Each pixel of the compressed image is given as an input to the network. This system is able to identify highly noisy or old image of TAKA. Ensemble network is very useful for the classification of different types of currencies. It reduces the chances of misclassification than a single network and ensemble network with independent training. [4]

#### C. Time Series Data and Fourier Power Spectra:

The paper [5], introduced by Trupti Pathrabe and Swapnili Karmore presented a new technique to reform the recognition skill and the avocation velocity to classify the Japanese and U.S. paper currency. This compares two samples of data sets, time series data and Fourier power spectra are used. In both cases, they are straightly used as inputs to the neural network. They also refer a new evaluation method of recognition skill. The mock-up paper currency is made in the printing house, but it is also feasible for any person to set a print mock-up bank notes with the help of a computer and a laser printer at home. The paper counterfeit notes can be distinguished effectively from original one by using authentic ones via robotic device which is the important device.

#### D. Image Processing Technique:

The paper [8], introduced by Sai Prasanthi and Rajesh Setty describes an approach for verification of Indian currency banknotes. The currency will be verified by

image processing techniques. In this article, six characteristic features are extracted. The approach consists of a number of components including image processing, edge detection, image segmentation, characteristic extraction, comparing images. The characteristics extraction is performed on the image of the currency and it is compared with the characteristics of the genuine currency. The Sobel operator with gradient magnitude is used for characteristic extraction. Paper currency recognition with good accuracy and high processing speed has great importance for banking system.

#### E. Haar Wavelet Techniques:

Yifeng Liu et. Al. [9] proposed that Haar wavelet is the simplest workable wavelet, and Support Vector Machine (SVM) is an effective classifier. This paper introduces a new pattern which combines the Haar wavelet and SVM for the first time to solve the problem of small title banknotes recognition with small computations, actual timing and superior performance. The vital overview of this method is to draw the waveform features and transform them to the digitalize support vectors with fixed length.

#### F. Image Based Techniques:

In [10] put forward a new image based technique for Birhani paper currency recognition based on two classifiers, the Neural Network and the weighted Euclidean distance using suitable weights. First of all quality of color image of paper currency is nearly equal to 600 dpi is achieved by scanning process. In pre-processing technique four different kinds of images are obtained from color image, which is the binary image; the gray scale image by Prewitt mask; the gray scale image by Sobel mask and the gray scale image by Canny mask. Then features are obtained by manipulating the sum of pixels of each of the four images. The Euler number is also calculated for each of the images then computed the correlation coefficient of input image after converting it to gray scale. After feature extraction paper currency classification is done by using two various techniques called Weighted Euclidean Distance (WED) and Neural Networks by feed forward back propagation.

### III. RESULTS AND DISCUSSION

**Table 1.** Performance of Various Techniques

Reference	Method	Currency Used	Remarks	Accuracy
<i>YingLi Tian et Al [1]</i>	Component based framework	US	Motion Blur Problem	96%
<i>Masato Aoba [3]</i>	Radius Basis Function	Euro	Three layer perception for classification and RBF for validation	100%
<i>Kalyan Kumar Debnath et al [4]</i>	Negatively Correlated Neural Network Ensemble	TAKA (Bangladeshi currency)	Ensemble neural network classifier and trained via negative correlation learning	100%

### IV. CONCLUSION

The survival of the financial symmetry may be affected with its value, rapidity, output and wellbeing by counterfeiting of bank notes. This paper deals with different literature which describes different techniques of paper currency recognition. With improvement of

recent banking services, automatic methods for paper currency recognition become vital in many applications such as in ATM and automatic goods seller machines. The system has a best performance for both agreeing valid banknotes and deleting invalid data.

This paper also shows the techniques for currency recognition using image processing. We have began developing an interactive system that solves this problems (ie.,) paper currency identification system for Indian currency using MATLAB. The Indian currency notes have been identified and counterfeit notes has been found. This work is done by using various filters. This method is very easy to implement in real time world. Atlast we have concluded that if we propose some efficient pre-processing and feature extraction method then we can improve the accuracy of identification system.

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