

Implementation Paper on Fake Currency Detection using Image Processing

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ABSTRACT

In this survey paper, Counterfeit currency is one of the biggest threats which creates vice to nation's economy and hence impacts the growth. Indian is one among them. With the any technology, anyone can print, Counterfeit currency. Day by day it becomes impossible for ordinary people to differentiate whether the notes are real or fake because they differentiate according to physical appearance. There are various challenge but counterfeit currency is one of the major problem countries in like India. Banks and other big organizations have their own automatic machines to identify counterfeit currency, so hence common people can hardly know difference between them. To identify the counterfeit Indian currency notes is done by using image processing method. In this process first the collection of images is done and then the images are processed. There are various steps to identify the fake currency such as image segmentation, edge detection, feature extraction, , image acquisition, converting in to grayscale , and comparing the images. In feature extraction, there are various features of currency such as water mark, latent image, security thread, micro lettering, fluorescent etc.

Keywords: Fake currency, counterfeit detection, image processing, feature extraction, deep learning.

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I. INTRODUCTION

In today's new new digitalization environment, the technology is rapidly growing. Due to these inventions the life of humans is changing rapidly. However, some people are misusing the benefits of such technologies to achieve their nefarious goals. One of the most prominent examples of this is a counterfeit note. In 2016 the pm of india has announced the discontinuity of 500 and 1000-rupees notes. The prime minister also announced the introduction of new rupee 500 and 2000 notes, as well as the discontinuation of existing rupee 500 and 1000 notes.[1]

According to rbi (reserve bank of india) reports the identification of fake currency notes decreased by 31.4 percent in 2017-18 compared to the previous year, due to high-security features on notes that make forgery difficult.[2].

However, a common people are unaware of all the security features. Developing systems to detect the counterfeit currency by the use of camera image is also helpful. To determine the legitimacy of the banknote artificial intelligence and machine learning (ml) can play a vital role

to design such a system that can identify fake currency from the genuine bank currency.

II. LITERATURE SURVEY

A. Commonly Used feature to detect counterfeit currency.

1) See Through Register

The floral design is printed in the middle of the vertical band and next to watermark. The floral designed on the front is empty and in back is filled up.



Fig.1. Security Features.

2) Latent Image

The latent image shows the original value in numerical. It is present on the right side of Mahatma Gandhi image on vertical band. When the currency is held horizontally at eye level then only the latent image is visible to a human eye.

3) Security Thread

The security thread in 2000 and 500 currencies, which appears on the left of the Mahatma Gandhi's image. In security thread the visible feature of RBI and BHARAT written in Hindi. When the currency of 2000 & 500 is held against the light, then and only then the security thread can be seen as one continuous green line.

4) Optically Variable

Numerals values in currency with rupee symbol is colour changing ink, the colour changes from green to blue on the bottom right

5) Number panel

Number panel with numerals which starts from small size to big size numbers and it is located on the top left side and bottom right side of the currency. These number panel is not available at back side of currency.

6) Identification mark

There are many special features in intaglio has been added recently on the left of the watermark window on all notes except Rs.10 currency. This feature is in different shapes for various denominations and helps the visually to identify the currency.

7)intaglio printing

The image of Mahatma Gandhiji, the seal of RBI and the promise clause, Ashoka Pillar Emblem on the left of Mahatma Gandhiji, RBI Governor's signature are printed in intaglio that is. in raised prints, which can be easily feel by touch, in all the bank notes.

B. Study of various research papers

Due to a review of the most recent currency in India after denomination, it is important to determine if the arrival notes inside the type of currency are genuine or not. The recently arrived money is in Indian rupees, with notes in denominations of 10, 20, 50, 200, 500 and 2000 rupees. Several researchers have proposed various methods to determine the legitimacy of a note. Some of the most relevant sources for reference are discussed below.

Akanksha, Dr. Vinod & Dr. Garima [1] proposed various technique. This paper provides quick overview about various methods and system and their respective accuracy rate for detection of fake currency. The effort is also made to analyse and compare the prediction and classification statistical technique i.e., logistic regression and LDA. Simulation results shows that Logistic Regression gives 99% of accuracy for designing a classification model. Hence this model can also be used statistical techniques for better performance and accuracy.

Adiba zarin & Jia Uddin [2] proposed a hybrid fake currency detection model and implemented on MATLAB. In the proposed model, three image processing algorithms were chosen to get enhanced results. The disadvantages of

the proposed model is it takes more time but it also gives 93.33% of accuracy. The developed system is also user friendly for the user.

Sonali Darade & prof.G.R. Gidveer [3] In this proposed system, detection of counterfeit currency is done by using image processing principle. Advantages are it is the low-cost system. The system works for currency such as 100, 500 and 2000 for Indian currency. The prototype also provides good accuracy and valid results. The process of detection of fake currency is very efficient.

Anuj Yadav, Tarun Jain, Vivek Verma & Vipin pal [4] in this proposed system there are various algorithms are used. SML algorithm SVM, LR, NB, DT, RF and KNN are applied to the counterfeit currency. Basically, the research also provides huge number of figures to compare various methods.

Kiran, anuthi, pranali & shruti [5] in this proposed system the major difficulties were solved by the DL (deep learning). architecture which is based on Deep CNN works as feature extraction and eliminating the need to apply image processing technique and the major disadvantages that this system is manually checking the presence of security features in the note. The dataset has successfully helped to conduct various experiments and tried to show mimic the real-world scenario also.

III. VARIOUS METHODOLOGY

Various algorithms used in detection of counterfeit currency are discussed below.

A. Calculation of Mean intensity of RGB channels

The approach for detecting fake Indian currency notes is based on image processing techniques. To find difference between real and fake notes, the mean strength of the red, green and blue channels of the image is determined and mainly three different features like the Latent image, RBI Logo and numeral value with Rupee symbol, are extracted. Colour being a common feature used by banknote designers to distinguish between them. The following are the step involved to detect counterfeit Indian currency notes: Acquisition of currency note using camera, Pre-processing the image, converting into grayscale, edge detection, performing image segmentation and extracting the required features, after extracting features then identifying the currency based on condition satisfied.

The technique has a accuracy of 76.66%. disadvantages in this model are that it applies to the newly issued Indian Currency Notes of 500 and 2000 only. In future, the validity of the newly released Indian paper currency such as 200, 100, 50 etc. can be verified. Further, work can be extended to improve the precision of the method.

B. K-NN Technique

This technique is structurally efficient and proposed using with K-NN algorithm for the detection and identification of counterfeit currency. The K-nearest-neighbour is an algorithm which is extremely simple to implement. To evaluate the K-nearest neighbours, the shortest distance

between the query instance and the training samples is used. The data for the K-NN algorithm is made up of a various number of multivariate attributes that will be used to identify the currency images. K nearest neighbours is an algorithm which stores all the cases and sort them in the new ones

using a similarity metric. The K-NN algorithm is a type of neural network, which is mainly used to recognition of pattern and also for statistical estimation.

The algorithm applied here is as follows: The image is acquired under UV light by Camera or scanner, the acquired Image is RGB image which is converted to grayscale image and later on applying Edge detection, the required characteristics features of the currency such as security thread , number panel etc will be cropped and then segmented, then the features of currency notes are extracted, the calculation of each feature is done, finally the conditions are checked and then determined the currency as original or fake.

C. Super resolution method

Super resolution is a tool form which we can use to improve the clarity of a currency. By this method a low-resolution image would be transformed to a high-resolution image. The framework used in this project is MATLAB. In This method is a novel image is processed in which the input image is zoomed out. It changes the resolution of a low-resolution image to a high-resolution image. As a result, the image's resolution or clarity is enhanced. This algorithm mainly deals with the image enhancement when the image is blurred or the resolution is poor. The dataset used here is of Indian currency photos. It includes illustrations of paper notes worth 10, 20, 50, 100, 500 and 2000 rupees. Following the application of the algorithm, it will classify the currency denomination as well as attempt to determine if the note is real or not.

Super resolution Algorithm follows various steps as are below: scanning an input image, to Convert the original image into Grayscale image, after that the super-resolution method will be applied, then Watershed segmentation method is used to segment the image, next is feature extraction takes place. And it's done by using the Optical Character Recognition (OCR) method to extract the text in the currency, after this currency is extracted, it will get identified and displayed, after identification of the currency image it will also verify that the image is a counterfeit one or genuine one.

As a result, it gives the highest level of accuracy in both identifying the currency and checking if the currency picture is fake or not. It can check whether the image is of a false or genuine one by extracting the multiple colours in the currency images. Future analyses of the current methodology used by the proposed arrangement will be carried out, ensuring the highest rate of accuracy.

D. K-means algorithm and SVM algorithm

In this method the proposed system for detecting fake currency is based on their various images which can be obtain from the original currency. In order to display a currency image, the dis similarity space which takes place after comparing two images, which is known as vector space. Each dimension represents the difference between the picture in question and a prototype. The local key points on each image are detected and defined in order to obtain

the dissimilarity between two images. The matched key points between the two images i.e., fake image or original can be efficiently defined based on the currency's features. A post-processing technique is also done to eliminate key points that are mismatched. A system for detecting fake currencies is established. The input from the given image will be first taken and the image processed and the RGB image will be converted into a grey image. The Sobel algorithm is used for removal of the inner and outer edges of the image after pre-processing. Clustering is achieved using an algorithm of k-means, in which it forms the clustering of feature one by one. Then compare image characteristics with the aid of SVM algorithm and classify them as original or fake.

K-means Algorithm: The K-Means algorithm m is an unsupervised algorithm which divides data input into several parts, on the basis of its inherent distance. The aim of k-means is to reduce to a minimum possible value the number of distances between all points and the cluster core.

SVM Algorithm: Support vector machines (SVM) are supervised learning systems with associated learning algorithms for machine learning analysis or classification of regression analysis.

The precision and accuracy of a system was measured using data from a dataset and observing the features of the Indian currency. These experimental findings show that the SVM Algorithm outperforms the K-NN Algorithm in terms of accuracy. according to the precision and accuracy of the method is very high. These figures are derived from a various sample note and the findings are observed using the data. In future, Application based system can be designed to differentiate between counterfeit and original currencies and the same system can be designed to check other Indian currency.

IV. RESULT



Fig. 2. Image Processing



Fig. 3. Result (CNN Prediction Real or Fake)

V. CONCLUSION

There are various algorithms which can be used to detect fake currencies, feature extraction and image processing methods remain unchanged. The most accurate and reliable method of detecting counterfeit currencies can be used by different combinations of features. The algorithm which can extract as much as feature from the original currencies and process them those algorithm shows more accuracy. The different techniques like Calculation of Mean intensity of RGB channels, UML and HSV Image, K-NN Technique, Super resolution method, DTCWT which provide good accuracy whereas Enhancement of Sift algorithm provides 87.74% accuracy, K-means algorithm and SVM algorithm provides 97% accuracy.

Most of these algorithms use images of original currencies taken from camera to create their own datasets or make use of existing datasets and compare these values with the test images to differentiate between original and fake currencies. But these algorithms also have some limitation too, that most of the algorithms are used on only one or two different currency denomination, which in future can be improved by them. Also, the currency image is taken from only from front side or both the sides. which can be further improved by taking the images from different angles in order to increase the level features. Circulation of fake currency leads to negative impact of countries economy; hence identification of fake currency becomes very important to the countries like India etc. As some of the techniques discussed in the above section are cost efficient and take less time. This must not be only limited to banks but also in shops or places where the give and take of cash occurs.

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