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# Image Processing Techniques for Fake Currency Detection

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*Abstract*—Producing money without the government's sanction is known as fake currency and it is a serious crime. An RBI research states that the number of counterfeit notes of the new Rs 500 series increased by 37% in 2019–20, while the number of Rs 2000 notes in circulation decreased. Not only banks but some other commercial institutions and establishments also now have resources and equipment to verify the legitimacy of the new notes . However, since the common people do not have means to access to these systems, there is a need for software that can be utilized by the general public to identify counterfeit money. The suggested solution makes use of image processing to identify  if the money is authentic or fake. The creation of the system is primarily done using the python programming language.

*Keywords - counterfeit currency , segmentation , edge detection, gray scale,  security thread.*

## I.   INTRODUCTION:

Different currencies are used by various nations worldwide to exchange certain types of goods for money. The introduction of counterfeit money into the system is one issue with currency that many nations share. India is among the nations that suffer greatly from counterfeit currency-related issues and losses. As a result, there are losses in the nation's currency value and general economy. For many nations, counterfeit money has grown to be a serious issue. Manual examination and other traditional detection techniques can be laborious and inefficient. Advances in the techniques of image processing  have made it possible to construct automated systems that can precisely and swiftly identify counterfeit cash. Advances in the techniques of image processing  have made it possible to construct automated systems that can precisely and swiftly identify

counterfeit cash. Through the use of machine learning models and algorithms, these systems are able to scan cash photos and detect patterns and textures that point to counterfeit money. Researchers are examining a wide range of novel techniques as  processing of image  technology develops, for instance  the application of terahertz and hyperspectral imaging. Therefore, image processing can be used to identify and eliminate counterfeit currency in order to prevent it from being used alongside real money.

## II.   ALGORITHM :

1.   Use your camera or the webcam to take a picture of the money.

2.   Adjust the image's size to the necessary dimensions.

3.   At first RGB coloured image is obtained and then we will have to  convert it into a black and white image .

4.   Edge detection of entire grayscale image  is done .

5.    To compare the collected image with the training dataset, specific area of the image will be cropped.

6.   Certain specific properties are extracted following segmentation.

7.   If the specified requirements are met, it will not be counterfeit, and the currency note will be accepted as authentic.

## III. METHODOLOGY

The steps that follow illustrates the many techniques used in image processing-based counterfeit cash detection.

### A. *Image Acquisition*

To reach our goal, we must first complete this step. Several processes are taken to process the image once it has been taken. Either a camera or a scanned image can be used to obtain the image. Every feature must be visible in the entire image. The pre- processing of the image is done in this step by adjusting the brightness, noises and fadedness that were acquired when the image was being captured.

### B. *Gray Scale Conversion*

Since the resulting image only included intensity, it was then transformed to black and white (grayscale). There are numerous established methods for turning photos into black and white.

### C. *Edge Detection*

This procedure is used to determine whether the image's edges are underneath it. If not, more steps need to be taken to crop the image or otherwise make it fit inside the frame.Numerous mathematical and analytical procedures are used to pinpoint the locations in the digital image. The process for cropping and scaling images uses the recognized image.

### D. *Image Segmentation*

In literal terms, this technique refers to scaling and cropping. To divide the photos into more segments, we employ a few built-in modules.Regression-based, clustering, and a few machine learning algorithms are among the techniques and modules.

### E. *Dimensionality Reduction*

To expose the noteworthy and intriguing portions of the image, or to decrease the dimensionality. As a consequence, a vector containing the image's characters is produced. We apply this extraction process when the image is huge and to lower the dimensionality in order to finish the given task as quickly as feasible and then send the image for the phase of comparison. If the scaling of the image is not performed then it will be challenging to retrieve the required data from the acquired image.

### F. *Comparison*

In the last stage, the processed picture is compared to the current data set to determine whether the note is authentic or fraudulent (counterfeit).

## IV. RESULTS

Money is a necessary means for survival so it is important that its originality is maintained. In India, paper money is used more prominently as compared to coins so a mechanism to identify counterfeit money is becoming a necessity. The methodologies which are being suggested in the paper are quite accurate and seem to be helpful in identifying the counterfeit currencies which are being circulated in the market for used and has made the lives of people more easier and fraudulent cases have been reduced. Compared to prior approaches, this one compares a larger number of features for feature extraction. It not only provides the results but also depicts the locations of the monetary differences.

As a future development, this system can be extended to support currencies from other countries like euros, won, taka, dollars , etc. A number of studies address various methods for identifying fake Indian rupee notes by utilizing machine learning and image processing techniques. These methods entail taking a picture of the note, analysing it with different algorithms, and splitting it up into different groups of pixels, or super-pixels. The legitimacy of the letter is then ascertained by comparing its attributes with MATLAB, artificial neural networks (ANNs), convolutional neural networks (CNNs) and support vector machines (SVMs),.

## V. CONCLUSION AND FUTURE WORKS

According to our study report, there are several methods for identifying fake money notes in India, including deep learning models, machine learning algorithms like SVM, and digital image processing. The techniques make use of frameworks like Keras, Theano, and TensorFlow as well as programming languages like Python and MATLAB. When compared to traditional procedures, these techniques are more accurate and extremely efficient in terms of both time and money. These techniques are meant to be accessible and easy for non-experts to utilize. Nevertheless, the techniques necessitate a working knowledge of computer languages, and the training dataset and image quality may have an impact on the approaches' accuracy. Furthermore, sophisticated counterfeit notes that closely mimic real notes could be difficult for these tools to identify.

Future fake currency detection systems can be made more reliable, effective, and easily accessible by fusing cutting-edge image processing techniques with cutting-edge approaches in artificial intelligence, blockchain technology, and user interface design. This will help to maintain financial transactions' trustworthiness and economic integrity.

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