

Real and Fake Currency Detection using ANN

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Abstract: Currency is the main form of exchange in India and is essential to the country's financial system, social progress, and economic growth. In today's highly technologically advanced culture, counterfeit money is a major problem since paper money is easy to move and safe to have, but its face value is significantly higher than its actual value.

Acknowledging the significance of preserving economic advancement, the Indian government has implemented policies like the demonetization of the Rs. 1000 and Rs. 500 notes. Though it becomes a possible target for counterfeiters, the introduction of the Rs. 200 note and the revised design for the Rs. 500, Rs. 100, Rs. 50, Rs. 20, and Rs. 10 notes provide new problems. The main problem with the hardware-based methods now in use for detecting counterfeit notes is that they are challenging for average people to use, even with their competence.

This essay looks at the characteristics that set the new legal tender from the Reserve Bank of India apart and uses methods to identify and confirm that it is real. a hybrid method that combines an ANN with a ResNet model, some architecture, and ANN adjusted parameters to accurately identify counterfeit money. This method employs residual networks (ResNet 50) and artificial neural networks (ANN) to recognize counterfeit currency based on its width, color, and serial number. To distinguish authentic notes from fakes, the system goes through a number of processes, such as pre-processing, segmenting, comparing, and extracting attributes from pictures. Finding counterfeit money is still a difficult and complex process. General Terms: Image Processing, Feature Extraction, Detection.

Keywords: Currency Segmentation, Canny Edge Detection, Financial System, Genuine Notes.

II. INTRODUCTION

This essay looks at the characteristics that set the new legal tender from the Reserve Bank of India apart and uses methods to identify and confirm that it is real. a hybrid method that combines an ANN with a ResNet model, some architecture, and ANN adjusted parameters to accurately identify counterfeit money. This method employs residual networks (ResNet 50) and artificial neural networks (ANN) to recognize counterfeit currency based on its width, color, and serial number. To distinguish authentic notes from fakes, the system goes through a number of processes, such as pre-processing, segmenting, comparing, and extracting attributes from pictures. Finding counterfeit money is still a difficult and complex process.

Cash recognition systems are typically used by banks, businesses, retail stores, rail stations, government agencies, and other organizations. But the public doesn't have access to

any way to identify currency, therefore they can't tell if an item is authentic. This is the reason that utilizing fake money is a common practice in our economy. Up to now, a large number of academics have contributed to the process of differentiating genuine currency notes from counterfeit ones.

II. LITERATURESURVEY

1. Bosubabu Sambana and Mohan Mahanty. An Artificial Neural Networks Based Fake Currency Detection System "International Journal of Computer Graphics 11(1):17-26[2020] the propose technique is input-output mapping with feature extraction technique with image separating and preparing procedure to recognizing and match the distinguished information required to analysed filter operations. The proposed system using each money note taken a Region of Interest (ROI) on existing currency note condition.
2. Ketaki Bhojar, Ankur Pandey, Aman Tekriwal, Prashant Mankani and Ankush Singh. "Detection of Fake Currency using Image Processing". IJERT[2020]. project will provide required mobility and compatibility to most peoples as well as credible accuracy for the fake currency detection. image processing and cloud storage are used to make this app portable and efficient.
3. Devid kumar, surendra chauhan "Indian fake currency detection using computer vision". IRJET[2018] The mainly use ORB(oriented fast and rotated brief) and brute-force matches approach to extract the feature of currency. This paper developed a computer vision based approach for indian paper currency detection by using feature extraction method of front and back side.
4. Tushar Agasti, Gajanan Burand, Pratik Wade and P Chitra, "Fake currency detection using image processing"[2017]IOP Conference Series: Materials Science and Engineering, Volume 263, Issue 5 This article explains how to analyze images of different aspects of Indian banknotes using MATLAB software to extract the characteristics. The advantages of the suggested system are its high performance speed and simplicity. The outcome will indicate whether or not the cash note is phony.
5. Rishabsingh, saurabh singh, deepak sharma, rashmita mohapatra, pranay rao, "Counterfeit Currency detection and classification" IJIRJET[2017] This project helps to detect the fake currency using image processing. They provide an extra facility of counting.

III. FEATURES



For example, we have new Rs.500 and Rs.200 notes. We will discuss their feature one by one.

First image is of Rs.500

Second image is of Rs.200

Rs.500 denomination bank notes are released in new series with in set letter 'E' in both the number panels and it also has the image of Mahatma Gandhi and signature of Governor Dr. Urjit R.Patel.

We shall talk about the characteristics of Rs500notes first.

Color

The color of Rs500 note is stone gray.

Size

The new Rs.500 note is smaller than previous note (size of at 63mm x 150 mm).

Bleed lines

There are seven “bleed lines” on the side of Rs.200 notes, and five lines on Rs.500 notes.

Latent image

In Rs.500 note there is latent image of the denomination in numeral.

Denomination numeral in Devanagari font.

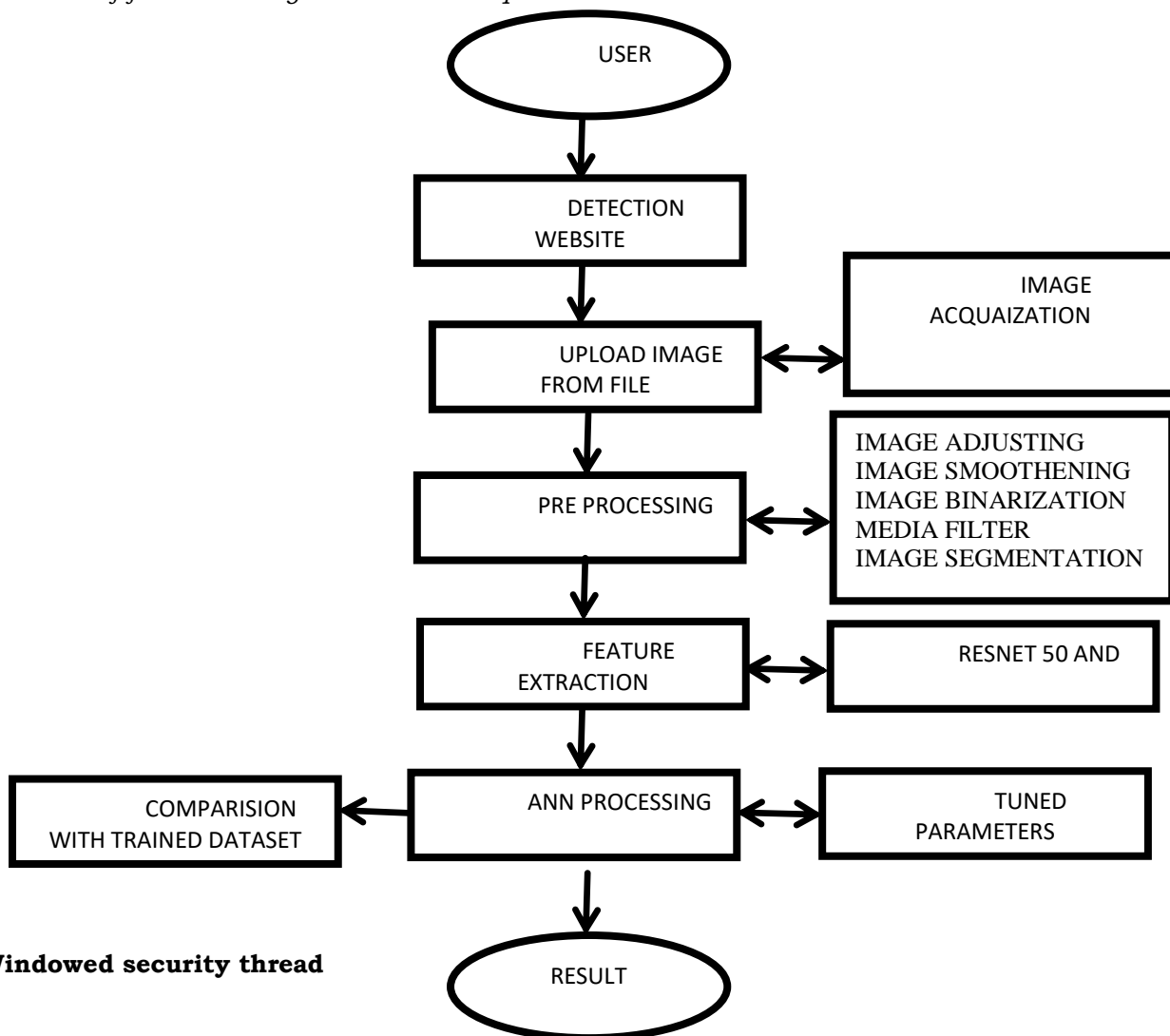
Devnagari font is also used on the currency of Rs.500.

Orientation

There are several differences between the current and previous Rs. 500 notes in terms of Mahatma Gandhi's orientation and relative location.

IV. PROPOSED DESIGN

A Flow of fake Currency detection technique



Windowed security thread

Rs.500 notes contain a readable, fully embedded windowed security thread with the inscription “Bharat” (in Hindi), and “RBI”. So, when the note is slanted, turns blue instead of green. Promise clause, RBI symbol relocated to the right, and guarantee clause all appear in the governor's signature.

Portrait

The portrait has been changed in raised manner. The orientation and the portrait of Mahatma Gandhi have been changed and we can see the electrotype watermark also.

Numerals

In new currency notes numerals are mentioned in the increasing order of their size from top-left side to bottom- right side.

Ashoka pillar emblem

On the right side Ashoka pillar emblem is present. Special Features of New Currency

1. Swatch Bharat slogan with logo.
2. At the center there is a language panel.
3. Red fort with Indian tri-color(flag)
4. At the right side denomination numeral in Devanagari C key features of Rs.200 notes.

Due to no of complaints about “counterfeit notes of Rs.200 denomination, common people are worried about its circulation. The essential characteristics of authentic notes vary. It is unique in both look and feel. Its reverse and obverse sides each have geometric motifs that complement the overall color scheme.

Color

New banknotes of Rs.200 are color changing notes. Paper color is magenta.

Size

The size of this note is 66mmx166mm. See through register-

In old notes the denomination’s numeral was written in the middle or at the Centre. Where as in the new currency note it is mentioned on the left hand side

Latent image

On the obverse side of Rs.200 and Rs.500, when the note is tilted at 45 degree, latent image of denominational value in numerical manner is displayed. When we hold the note at an angle of

45 or when note is held against light the numeral 200 can be seen very clearly.

Watermarks

We can see the watermark of Mahatma Gandhi and 200 numeral in the new currency note. .The portrait of Mahatma Gandhi is displayed in raised manner as compared to the previous currency notes.

Windowed security thread

There are three names that are present on the security thread

i.e. Bharat, RBI and 200 printed in raised manner with shift in their colors when held at different angles .Because of this special feature visually challenged people can easily identify the notes.

Number panel

Number panel with numerals growing from small to big on top left and bottom right sides

These are the front side features, now let’s discuss about the reverse side features.

Reverse side features

- 1) ‘Swatch Bharat logo with slogan’-
Swatch bharat logo is placed on spectacle with slogan “Ek kadam swatchta ki aur” it is the part of Narendra modi’s “Swatch Bharat Abhiyaan”.

- 2) **The Symbol of Mangalyan-**
We have a new feature in this new note that is the symbol of Mangalyan. There was a report that this new money included an inbuilt GPS device that could locate notes with ease. However, it does not have a GPS chip in it. It is a component of India's expedition to Mars, and following that, India was admitted into the interplanetary realm.
- 3) **Orientation of Mahatma Gandhi**
Orientation and size of portrait of Gandhi ji has been changed and placed in raised manner.
- 4) **Number panel**
The current note has a number panel with numerals on the top left and bottom right sides that increases in size from smaller to larger.

V. METHODOLOGY

This work proposes a hybrid approach leveraging Artificial Neural Networks (ANNs) and deep learning for counterfeit currency detection. We utilize a dataset acquired from Kaggle, a public data repository. The data undergoes preprocessing steps to ensure consistency and quality. Subsequently, a deep learning algorithm extracts relevant image features from the currency images. These features are then employed to train an ANN model, enabling it to distinguish genuine from counterfeit currency.

For user interaction, a web application is developed using Flask, a Python framework. This application facilitates image upload by users. The uploaded image is processed through the trained model, and a prediction (genuine or counterfeit) is delivered as the output. Python serves as the primary programming language, with Anaconda for environment management and Jupyter Notebook for interactive development. Visual Studio Code is the chosen tool for code editing.

This approach offers a user-friendly and potentially highly accurate solution for fake currency detection with 96% accuracy.

The steps involved in methodology are as follows:

Image Acquisition (Input Image):-

This method involves first importing the image using direct photography or an optical scanner. Several sources, both hardware- and software-based, can be used to read the picture. Whenever verification is conducted, image processing technology ought to be utilized. We are unable to execute any operations without a picture. A crucial component of any verification is extraction and detection.

Image pre-processing:-

To extract features from pictures and carry out various operations for document verification, image pre-processing is utilized.

Image adjusting:-

The size of a picture is much larger when it is created using a scanner or other digital equipment; nevertheless, when we manipulate the image, we should first minimize its size before applying any more processing. And the adjust function in Python is used to complete this operation. Better software is used to manipulate images.

Image smoothening:-

During this procedure, the picture may be taken using a digital camera or scanned with a scanner. After either method, the image may have some noise. We need should have to stop that noise first. In the field of image processing technology, feature extraction and detection are crucial tasks.

Median filter:-

Filtering techniques should be applied while processing the picture. Several techniques are employed by the authors to filter the picture for the process.

Image Binarization

Document image binarization is often carried out during the preparatory phase of several document image processing applications, including document image retrieval and optical character recognition (OCR). The process of converting a gray scale document picture into a binary document image makes subsequent jobs easier, such document skew estimates and document layout analysis. Rapid and precise document picture binarization is becoming more and more crucial as text documents are scanned more often.

Image Segmentation

It establishes the borders of regions inside a picture. It can investigate a wide range of methods for thresholding and segmenting images. Ideal Worldwide Thresholding:

If there are as few incorrectly categorized pixels as possible, a threshold is considered globally optimum.

The histogram has two modes: background and object.

Either the background or object histograms are known, or the ground truth is known.

Feature Extraction

It's a difficult task to process digital images. Feature extraction is one of the hardest challenges in any currency identification system. Here, the goal is to analyze and pinpoint each denomination's distinctive qualities in a variety of difficult scenarios, including old or worn-out notes as well as varied lighting and backgrounds.

VI. IMAGE DATABASE

The dataset for image comparison with input image will be taken from Kaggle and this will be done by ANN processing.

VII. CONCLUSION

Since the greatest value currency in India right now is Rs.200, there is a possibility that new currencies may be duplicated and scammed in the next years. Therefore, we need to create a module that can quickly and accurately distinguish between real and counterfeit cash and automatically identify the actual note.

VIII. REFERENCES

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- [5] Rishabsingh, saurabhsingh, Deepaksharma, rashmita mohapatra, pranay rao,"Counterfeit Currency detection and classification "IJIRJET[2017].