



Fake Currency Detection Using Image Processing

**Ms. R Lalitha¹, Saikrishna Satheesan², Nandana Kevees³, Gaurav Prashant Kalgutkar⁴,
Humbrekhal Fawaz Ahamed⁵**

Student, Dept. of Computer Science & Engineering, Mangalore Institute of Technology & Engineering, Moodabidre, India^{2,3,4,5}

Assistant Professor, Dept. of Computer Science & Engineering, Mangalore Institute of Technology & Engineering, Moodabidre, India¹

Abstract: Counterfeiting of currency has become a real threat to the livelihood of people as well as the economy of our country. Though fake currency detectors are available, they are restricted to banks and corporate offices leaving common people and small businesses vulnerable. So, in this project, we will investigate the various security features of Indian currency and then, prepare a software-based system to detect and invalidate fake Indian currency by using advanced image processing and computer vision techniques. This currency authentication system is designed completely using Python language in Jupyter Notebook environment.

Keywords: Fake currency, counterfeit detection, image processing, feature extraction, Bruteforce matcher, ORB detector

I. INTRODUCTION

Currency duplication or production of counterfeit currency notes illegally by imitating the actual manufacturing process is a huge problem that every country is facing. Fake currency can reduce the value of real money and cause inflation due to an unauthorized and unnatural increase in the money supply. Manual authentication of currency notes is a solution but it is a very time-consuming, inaccurate, and difficult process. Automatic testing of currency notes is, therefore, necessary for handling large volumes of currency notes and then, getting accurate results in a very short time span. In this project, we propose a fake currency note detection system using various image processing techniques and algorithms.

The proposed system is designed to validate Indian currency notes of denomination 500 and 2000 rupees. The system consists of three main algorithms and checks the authenticity of various features in a currency note. The first algorithm consists of several steps including image acquisition, pre-processing, greyscale conversion, feature extraction, image segmentation, comparisons of images and output, and uses advanced image processing methods such as ORB and SSIM.

The second algorithm authenticates the bleed lines of the currency notes whereas the third algorithm authenticates the number panel of the currency notes. Finally, the processed output is displayed for each currency note. This system provides a hassle-free way to authenticate currency notes quickly and accurately. This automated system can replace the existing manual methods and can be used by anyone easily to detect fake currency.

II. METHODOLOGY

Requirement Analysis:

- Define the objectives and scope of the project.
- Gather requirements from stakeholders to understand their needs.
- Identify the constraints, such as budget, time, and available resources.

Literature Review:

- Conduct a thorough review of existing literature, research papers, and projects related to fake currency detection and image processing.
- Analyze different techniques and algorithms used in image processing for feature detection and currency authentication.

**System Design:**

- Design the overall system architecture, including the user interface, image processing modules, and authentication module.
- Define the functionalities and interfaces of each module
- Decide on the programming languages, frameworks, and libraries to be used.

Data Collection and Preprocessing:

- Collect a dataset of genuine and fake currency images.
- Preprocess the images to enhance quality, remove noise, and standardize them for further processing.

Feature Extraction and Classification:

- Implement algorithms for feature extraction from currency images, such as edge detection, texture analysis, and color histogram.
- Train a classifier using machine learning or deep learning techniques to classify currencies as genuine or fake.

System Implementation:

- Develop the user interface for capturing images and displaying results.
- Implement the image processing modules for preprocessing, feature extraction, and classification.
- Integrate the authentication module to verify the authenticity of the currency.

Testing and Evaluation:

- Conduct extensive testing to ensure the correctness and robustness of the system.
- Evaluate the performance of the system using metrics such as accuracy, precision, recall, and F1-score.
- Gather feedback from users and stakeholders for further improvements.

Documentation and Deployment:

- Document the system architecture, algorithms, implementation details, and user manual.
- Prepare deployment packages and instructions for installing and running the system.
- Deploy the system in the target environment and provide necessary support for users.

Maintenance and Enhancement:

- Monitor the system for any issues or performance degradation.
- Address bug fixes and security vulnerabilities as they arise.
- Continuously improve the system by incorporating new techniques and algorithms for better detection and authentication.

By following this methodology, you can systematically plan, develop, and deploy the "Fake Currency Detection using Image Processing" project while ensuring its quality and effectiveness.

III. LITERATURE REVIEW

[1] In this paper an automatic system is designed for identification of Indian currency note is fake or original. The automatic system is very useful in the banking system and other fields also. In India increase in the fake currency notes of 100, 500, and 1000 rupees. As there are increases in technology, like scanning, colour printing, and duplicating, there is an increase in the counterfeit problem. In this model first the image acquisition is done and applies to pre-process to the image. In pre-processing crop, smooth and adjust then convert the image into grey colour after conversion applies the image segmentation then extract features and reduce, finally comparing image.

[2] In this paper, An automatic recognition of fake Indian paper currency note using MATLAB is implemented and feature extraction with HSV color space and other applications of image processing. The proposed architecture is as follows Image Acquisition, Gray-Scale Conversion, Edge Detection, Image Segmentation, Characteristic Extraction, Comparison, Output. In the project setup, a note is placed in front of the camera to check whether it is fake or genuine. The clicked pictures of notes are analyzed by MATLAB program installed on the computer. This algorithm works for Indian denomination 100, 500, 1000. If the note is genuine, the respective message is appeared on the screen and vice-versa.

[3] In this paper, a hybrid fake currency detection model was proposed and implemented on MATLAB. The model was designed to detect fake Bangladeshi notes.



In the proposed model, three image processing algorithms were chosen namely Optical Character Recognition(OCR), Hough Transformation and Face recognition(MSD) to get enhanced results. Then, the results of the proposed model were compared with each model used. The algorithm followed six basic steps: data collection, pre-processing of the collected data, edge detection, feature extraction, identification and output results. In addition, although the proposed model took slightly longer to process, it displayed 93.33% accuracy which was significantly higher compared to the individual algorithms applied.

[4] In this paper two ways are used: one by using analysis through hyper spectral imaging and the second one is the Extraction of different features in fake and real currency notes and through comparing with each other we can able to differentiate the fake note from the real note. The different colour lights used for hyper spectral imaging are Ultraviolet (UV) light, Normal LED Bulb, Red LED light, Green LED light and Blue LED light with different wavelengths ranging from 360 nm to 800nm respectively. This all modules are implemented in MATLAB. They have implemented a fake note detection unit with image processing algorithms. The experimental results indicate that the results achieved are nearly accurate.

[5] In this paper the recognition and verification of the paper currency is explained with the use of image processing techniques. The proposed approach consists of multiple element transactions like Image Acquisition, Feature extraction and comparison, Texture features, and Voice output. This system is divided into two parts. The first part is to identify the currency denomination through image processing. The second part is the oral output to notify the visually impaired person about the denomination of the note that he/she is currently having. The desired results will be in text and voice output of the currency recognized and verified. SUMMARY

IV. CONCLUSION

In this paper, a fake currency detection model has been proposed for authentication of Indian currency notes of denomination 500 and 2000 and implemented using OpenCV image processing library in Python3. In this model, 10 features of the input currency note are considered and then analyzed using 3 different algorithms. The input image is taken through a GUI which allows the user to browse the image in his/ her system. Then the results of the implemented model are computed and the analysis of each feature is displayed in detail through a graphical user interface (GUI) created using Tkinter GUI library.

The model takes less time (about 5 sec- when only final results are shown leaving unnecessary details) for processing an input image. The results are also quite decent giving almost 79% accuracy in detecting genuine currency and 83% accuracy in detecting counterfeit currency.

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