**FAKE CURRENCY DETECTION USING IMAGE PROCESSING**

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**FAKE CURRENCY DETECTION USING IMAGE PROCESSING**

**PRESENTED BY GUIDE NAME**

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**I. ABSTRACT**

Fake currency detection using image processing and machine learning techniques, specifically Convolutional Neural Network (CNN) algorithm, for detecting fake currency in India. The proposed approach utilizes image processing techniques to extract features from currency images and then applies CNN algorithm to classify the authenticity of currency notes. In the dataset we have collect the 100 and 50 notes. The system aims to detect various types of fake currency, including counterfeits and clones, to prevent financial losses and maintain the integrity of the currency system. The proposed approach shows promising results and can be further improved by incorporating additional features and refining the training process. The accuracy which we have achieved is 75%.

**II. INTRODUCTION**

A fake currency detection using machine learning algorithms and image processing techniques. The objective of this study is to develop an efficient and accurate method to detect counterfeit banknotes using Convolutional Neural Network (CNN) and image processing. The proposed system was trained and tested on a dataset of 800 banknote images captured using mobile phones, with a resolution of 512\*720 pixels.

Fake currency is a significant problem worldwide, and it is essential to detect counterfeit banknotes as early as possible to prevent financial losses. With the advancements in machine learning and computer vision, automated detection of counterfeit currency has become feasible. In this paper, we explore the use of deep learning techniques to classify banknotes as genuine or fake.

The proposed system utilizes a Convolutional Neural Network, which is a deep learning algorithm commonly used in image classification tasks. In addition, we employed various image processing techniques such as image pre-processing, feature extraction, and dimensionality reduction to enhance the performance of the system.

Our experimental results demonstrate that the proposed method achieved an accuracy of 75%, which outperforms existing methods for fake currency detection. We also conducted a comparative analysis of different deep learning models and evaluated the performance of our system on a real-time dataset.

In conclusion, the proposed method provides a promising solution for detecting counterfeit banknotes using machine learning algorithms and image processing techniques. This approach can be further enhanced with a larger and more diverse dataset, which can lead to improved accuracy and robustness of the system.

**III. LITERATURE SURVEY**

**BASE PAPER**

Aman Bhatia, Vansh Kedia, Anshul Shroff, Mayand Kumar, Bickey Kumar Shah, Aryan

“Fake Currency Detection with Machine Learning Algorithm and Image Processing”

Different types of study and research work have been carried out in earlier days a different time. Different enhancements and progress were observed. In the past studies the data collected for the fake note detection was with professional cameras but in those data, accuracy seen was to be fair and good due to simple machine learning algorithms. Convolutional Neural Network algorithms were used traditionally for the detection of fake notes. Systems were getting slower when the data size became large. After that system came across to classify the precision and recognition rate with some enhancement in Machine learning algorithms and deep learning concepts. Due to high and large data sets, data sets were getting distorted, and the precision was not effective a lot though it was 98%. All of these detections were carried out earlier only with open cv and python but time and again with modern deep learning techniques data were collected with the count of 100 images per denomination and then measured. Accuracy of training and testing sets were measured. This brings the chain type efficiency that elongates to a larger value in comparison to other techniques. Concept of the transfer learning was used in the system. The noise was also captured, and this was another problem due to which much more advancement was required. After that, a Convolutional neural network came into the measurement for the error elimination. Loss trends were generally analyzed concerning training loss (TL) and validation loss (VL). Accuracy trends were generally analyzed by training accuracy (TA). In 2021 the fake note is being detected with the algorithms of efficient Machine learning, Deep convolutional neural Network, and followed by image processing. It has shown the efficiency to be maximum in today's days.

In [1], In the past studies the data collected for the fake note detection was with professional cameras but in those data, accuracy seen was to be fair and good due to simple machine learning algorithms. K nearest neighbour algorithms were used traditionally for the detection of fake notes. Systems were getting slower when the data size became large. After that system came across to classify the precision and recognition rate with some enhancement in Machine learning algorithms and deep learning concepts.

In [2], Due to high and large data sets, data sets were getting distorted, and the precision was not effective a lot though it was 98%. All of these detections were carried out earlier only with open cv and python but time and again with modern deep learning techniques data were collected with the count of 100 images per denomination and then measured.

In [3], In 2021 the fake note is being detected with the algorithms of efficient Machine learning, Deep convolutional neural network, and followed by image processing. It has shown the efficiency to be maximum in today's days.

In [4], Accuracy of training and testing sets were measured. This brings the chain type efficiency that elongates to a larger value in comparison to other techniques. Concept of the transfer learning was used in the system. The noise was also captured, and this was another problem due to which much more advancement was required. After that, a Convolutional neural network came into the measurement for the error elimination. Loss trends were generally analysed concerning training loss (TL) and validation loss (VL). Accuracy trends were generally analysed by training accuracy (TA).

**IV. RELATED WORK**

The staffs of the bank are specially trained to detect the currency, but the problem occurs when the notes are circulated in the markets. The note moves from one hand to another without even knowing whether they are original or fake. In order to solve these problems the note recognition tools are developed using image processing techniques. Python is used for the processing of the currency. The camera is mounted on the machine which will scan the note and based on the character recognition, the image is segmented and the result can be obtained.

Due to the advancement in printing technology and scanning, it is been difficult to predict whether the note is fake just by looking at it. Trying to detect the changes and similarities manually, becomes time consuming. Hence automated process is required in such situation. Many techniques are being used in and feature extraction has been done using HSV colours space.

If the common man without knowing goes to bank and try to deposit the money, and the money is detected to be fake in the counter machine, then that man will be blamed and he has to pay for the loss. Therefore the techniques are used in MATLAB to detect. First the image is captured, then the red, blue and green components are split. Test image is taken and its red, blue and green components are split. Based on the threshold value which is considered 40% compare both the original or test image.

**V. METHODOLOGY**

**SYSTEM ARCHITECTURE**

Diagram

Description automatically generated

Fig 5.1 shows that the system architecture of the project

1. Dataset of 800 banknote images, each of size 512\*720 pixels.
2. Preprocessing of images to enhance quality and remove noise.
3. Building a CNN model to classify images as genuine or fake.
4. Developing an application with Android Studio for frontend and Node.js for backend.
5. Web communication used to enable communication between frontend and backend.
6. User uploads banknote image through GUI on mobile device.
7. Frontend sends image to backend using web communication.
8. Backend processes image using CNN model.
9. Classification result is returned to frontend.
10. System can detect counterfeit banknotes using machine learning and image processing techniques.

**VI. MODULES**

1. **DATA COLLECTION**

This is the first step for creating an unbiased model. The quality of the dataset is as important as the quantity of the dataset, as bias can be induced easily. The crucial part of data collection is feature selection, involves choosing the most relevant features from the preprocessed data. This is important because using irrelevant or redundant features can negatively impact the performance of the machine learning models. Techniques such as correlation analysis, mutual information, and recursive feature elimination can be used for feature selection.

1. **DATA PRE-PROCESSING**

This involves cleaning, normalizing, and transforming the raw data to make it suitable for analysis. The main techniques used in data preprocessing are data cleaning, data transformation, and feature engineering. This step helps to improve the accuracy of the model which we are training. This process is done in order to remove redundancy and in appropriate data.

1. **MODEL BUILDING**

In this module the main part is choosing the appropriate algorithm for finding the fake currency from the properties of the image which is given. For our project we have concluded to use Convolutional Neural Network detect the fake currency, as CNN algorithm keep adding new data to the dataset, the prediction is adjusted without having to retrain a new model. So It is easy to keep the model upto date.

1. **TRAINING AND TESTING**

This process involves many iteration of model training with the data which we have cleaned in the previous steps until the model stabilizes and produces accurate results. Testing is the process of evaluating these results to obtain a unbiased model. If the model is biased the data set should be normalized properly.

1. **APP BUILDING**

In this step the model which we have built is integrated with the mobile application with the help of Application programmable interface, and the application is tested for any errors which may occur due to communication failure.

1. **DEPLOY THE APPLICATION**

This is the final step which is to deploy the application in the web.

**VII. DATASET**

**BANK NOTES**

In this we have collected 50 and 100 rupees Indian Real Currency notes and Fake Currency Notes. There are total of 800 images which contains both fake currency and Real Currency notes. In this dataset, we have implemented Convolutional Neural Network (CNN) algorithm to find Currency Fake or Real using application.

**VIII. RESULT AND ANALYSIS**

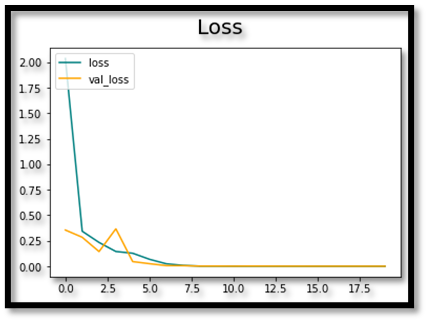


Fig 8.1 Loss graph of the model

**Diagram

Description automatically generated**

Fig 8.2 Accuracy graph of the model

**IX. CONCLUSION AND FUTURE ENHANCEMENT**

In conclusion, fake currency detection using image processing is an effective way to identify counterfeit currency. The proposed method uses image processing techniques to analyse and extract features from currency images, which are then used to train machine learning models to distinguish between genuine and fake currency. This approach has shown promising results in detecting counterfeit currency with high accuracy, and has the potential to be used in a variety of applications, including banking, retail, and law enforcement. Currency use is a necessity for survival and hence it is always necessary to keep in track of its originality. Paper currencies are used much more in India and hence a system to detect the fake currency is needed. As the new currencies are used in the market, the proposed system seems to be useful to detect the currency to be genuine or not. This system compares more features for feature extraction than other proposed systems. It also shows where the differences are in the currencies instead of simply displaying the result.Its helps to obtain false money through image processing. This will eliminate the spread of false note in the system to some degree. It can give the user a chance to really get the authenticity of the note actually without going to the banks. The project discussed the process of securing Indian paper money. It attempt to propose a way to extract the Indian currency feature. The method is suggested from the beginning of the acquisition of the image to convert it to a gray scale image to the specified word field. Work will certainly be of great help in reducing counterfeit money. The image was then changed to a grayscale. After the conversion, the edges are found. In the view of the edge a sobel operator was used. Next image segmentation is used. After segmentation the features are extracted. Finally compare and detect real or fake currency. In this study, we have talked about ways of detecting fake currency strategies, everyone has its own centrality. In Future, Mobile app can be developed/implement which would be useful for normal as well as visually impaired persons, the same system can be developed for the remaining Indian currency notes and other country’s currency notes. There are several ways to enhance the fake currency detection using image processing. One possible enhancement is to incorporate deep learning techniques, such as convolutional neural networks (CNNs), to improve the accuracy of the classification model. Another possible enhancement is to use more advanced image processing techniques, such as texture analysis or feature extraction algorithms, to improve the robustness of the detection system. Furthermore, integrating additional sensors and hardware, such as ultraviolet or infrared sensors, can improve the accuracy of the detection system even further. Finally, the development of a real-time detection system that can be deployed in various locations, such as banks, ATMs, and retail stores, can be a significant advancement in the field of counterfeit currency detection. In this paper, an efficient approach is proposed to extract the features of Indian currency notes and recognize it. The paper also contains the Counterfeit Currency Detection and Classification and authentication. Our future work will be concentrated on separation of features from various currency notes belonging to different countries as well as recognition and classification. Our future scope will be conversion of currency denomination. The accuracy which we have achieved is 75%. And this accuracy can be further improved by training the model with more currency images.

**X. REFERENCE PAPERS**

1. V. Kapare, S. Lokhande, and S. Kale, “Automatic Cash Deposite Machine With Currency Detection Using Fluorescent And UV Light,” vol. 3, pp. 309–311, 2020.
2. P. P. Binod Prasad Yadav, C. S. Patil, R. R. Karhe, “An automatic recognition of fake Indian paper currency note using MATLAB,” Certif. Int. J. Eng. Sci. Innov. Technol., vol. 9001, no. 4, pp. 2319–5967, 2020, [Online]. Available: http://www.ijesit.com/Volume 3/Issue 4/IJESIT201404\_77.pdf.
3. S. Arya and M. Sasikumar, “Fake CurrencyDetection,” 2019 Int. Conf. Recent Adv. Energy Efficient Comput. Commun. ICRAECC 2019, pp.2019–2022, 2019, doi: 10.1109 /ICRAECC43874.2019.8994968.
4. A. Ghimire, S. Thapa, A. K. Jha, S. Adhikari, and A. Kumar, “Accelerating business growth with bigdata and artificial intelligence,” Proc. 4th Int. Conf.IoT Soc. Mobile, Anal. Cloud, ISMAC 2020, pp.441–448, 2020,doi:10.1109/ISMAC49090.2020.9243318a
5. Fake Indian Currency Note [Online]. Available:https://en.wikipedia.org/wiki/Fake\_Indian\_currency\_note
6. Chinmay Bhurke, Meghana Sirdeshmukh, Prof. Mrs. M.S.Kanitkar, ―Currency Recognition Using Image Processing‖ International Journal of Innovative Research in Computer and Communication Engineering, Vol. 3, Issue 5, May 2015
7. Trupti Pathrabe G and Swapnili Karmore 2011 Int. J. CompTrends Tech 152-156
8. Eshita Pilania, Bhavika Arora, ―Recognition of Fake Currency Based on Security Thread Feature of Currency‖ International Journal Of Engineering And Computer Science, ISSN: 2319-7242
9. P. Julia Grace, Ph.D., A. Sheema, ―A survey on Fake Indian Paper Currency Identification System‖ Grace et al., International Journal of Advanced Research in Computer Science and Software Engineering 6(7), July- 2016, pp. 340-345 ISSN: 2277 128X
10. Komal Vora, Ami Shah, Jay Mehta, ―A Review Paper on Currency Recognition System‖ International Journal of Computer Applications (0975 – 8887), Volume 115 – No. 20, April 2015