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Prediction of Indian Currency Using Artificial Neural Network

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Abstract: *The ANN-based currency identification system aims to enhance the accuracy and speed of recognizing diverse Indian currency denominations. Traditional methods fall short due to the complexity of Indian money's varied designs, sizes, and security features. Deep learning and ANNs are well-suited for currency classification by analyzing extensive data and detecting intricate patterns. The framework trains on a dataset of Indian banknotes and coins to identify distinctive features such as color and design. This system can improve financial transactions, minimize errors, and bolster security across banking, retail, and security sectors.*

Keywords: Deep learning, financial transactions, currency classification, security features

I. INTRODUCTION

The accurate and rapid identification of currency denomination is a critical component of modern financial systems, impacting various sectors, including various sectors, including banking, retail, and security. In India, where a diverse range of currency notes and coins is in circulation, the need for efficient denomination prediction has become increasingly important. Traditional methods of denomination recognition often fall short in handling the complexities posed by Indian currency, given the variations in design, size, and security features across different denominations. In response to these challenges, this research embarks on a journey into the world of deep learning and artificial neural networks (ANNs) to revolutionize currency denomination prediction. With the development of modern banking, automatic banknote identification methods are becoming important in many applications such as in automated teller machines and vending machines. The need for automatic banknote identification systems has encouraged many researchers to develop corresponding robust and reliable techniques.

1.1 PROBLEM STATEMENT

The problem revolves around the need for a robust system capable of accurately determining the denomination of Indian currency notes. This need arises in various financial and automated systems, such as ATMs, cash-counting machines, and point-of-sale terminals, where the seamless handling of currency notes is contingent on precise denomination prediction.

II. LITERATURE SURVEY

An innovative computer vision method for detecting and recognizing Indian currencies [1]. It extracts color, aspect ratio, and a unique identification mark.

The unresolved challenges in currency recognition, specifically focusing on various Indian denominations [2]. It extracts six key currency features and highlights the importance of high- resolution, uniformly sized images, along with feature-based image enhancement.

A robust deep neural network (DNN) model, based on YoloV5, was developed for detecting Indian currency note denominations in real-life images [3]. Training on unfolded currency data yielded an impressive average detection accuracy of 92.71%.

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The three algorithms employed for classifying genuine and counterfeit currency notes showed exceptional accuracy, with KNN outperforming the others, achieving a 99.9% accuracy rate and only misclassifying 2 counterfeit notes [4]. However, this result is limited due to a relatively small dataset of 1372 samples, which may not generalize well in real-world scenarios.

A novel method is used for smartphone-based banknote detection in complex backgrounds [5]. It combines three stages of detection to enhance accuracy: initial vgg-16-based Faster R-CNN, post- processing based on features like width-to-height ratio and score, and final verification with resnet- 18-based Faster R-CNN.

The training and testing multiple SSD framework models to select the best one, all based on empirical methods [6]. A 6-layer CNN model is used for feature extraction, with quadri-lateral boxes initially set to 1.0 for currency recognition training.

India paper currency recognition system that can distinguish between genuine and counterfeit notes [7]. It relies on image processing using Open-CV in Python, analysing features like latent image, security thread, watermark, and identification marks to identify real from fake currency.

An innovative computer vision method for detecting and recognizing Indian currencies[8]. It extracts colour, aspect ratio, and a unique identification mark.

In today's context, paper currency holds economic significance with a face value surpassing its intrinsic worth, offering elasticity, stability, ease of counting, portability, and safe storage[9]. However, the rising issue of counterfeit currency detection is crucial as counterfeiters employ increasingly sophisticated methods that escape human visual detection.

Researchers have made considerable efforts in recent years to develop various techniques for identifying and detecting currency denominations [10]. These solutions encompass hardware-related methods, image processing, and machine-learning approaches.

III. METHODOLOGY

Image preprocessing improves image clarity by removing noise, adjusting contrast, and ensuring consistent size and format. Feature extraction identifies essential characteristics like edges, textures, and watermarks that differentiate currency denominations. These features are fed into an Artificial Neural Network (ANN), which learns to associate specific feature patterns with corresponding denominations through training on a dataset of labeled currency images. Finally, the trained ANN predicts the denomination of a new, unseen currency image based on its extracted features.

3.1 PROPOSED SYSTEM

The proposed system is a digital tool capable of determining the value of a currency note. It operates by capturing an image of the note and subjecting it to image processing techniques to enhance visual clarity and extract key features. These features, such as color patterns, watermarks, and geometric shapes, are then analyzed by an Artificial Neural Network (ANN). The ANN, trained on a vast dataset of currency images, learns to recognize specific feature combinations associated with different denominations. By comparing the extracted features of the input image to its learned patterns, the system accurately predicts the currency note's denomination.

3.3 DATA FLOW DIAGRAM

The Level-0 DFD outlines the Indian money recognition system's workflow, starting with user- provided image input. Image preprocessing enhances quality for analysis, while feature extraction identifies key characteristics of Indian currency. The DFD demonstrates the system's process from image input to final classification, ensuring efficient and reliable money recognition.

User input initiates the system, providing essential data for subsequent processing and classification stages.The structured approach enables seamless integration into various applications requiring accurate and fast money recognition.

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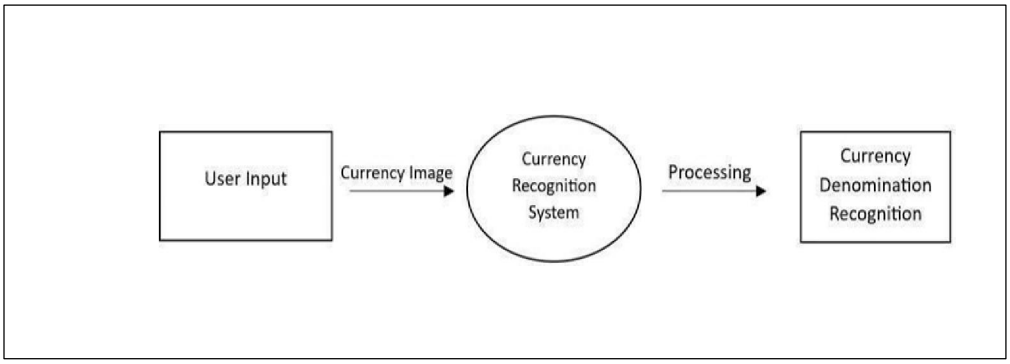

Fig 3.2 DFD of Indian currency recognition system.

3.3 ANN

Artifical Neural Systems (ANNs) are a top subset of machine knowledge propelled by the structure and workof the mortal brain. ANNs comprise connected eyes, or neurons, organized in layers an input estate, one or further covered up layers, and a yield estate. Each neuron gets input signals, forms them exercising an enactment work, and passes a yield flag to the other estate. The quality of ANNs lies in their capacity to learn complex designs and connections from information without express programming.

IV. CONCLUSION

The prediction of Indian currency denomination using Artificial Neural Networks (ANNs) with GLCM features extracted from a carefully prepared dataset and a Multi-Layer Neural Network (MLP) holds great promise. This approach leverages the power of machine learning and image processing to classify and identify Indian currency denominations effectively. Through the utilization of GLCM features, the ANN can capture texture and structural information from the currency images, enabling accurate predictions. The system's robustness showed the identification with an accuracy of 90% for note currency. Our system is also trained to identify the front/back Indian coin recognition with an accuracy of 86.67 %. The system's robustness and accuracy make it a valuable asset in the financial industry, offering benefits such as reduced errors, improved currency handling, and enhanced security.

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