

INDIAN CURRENCY RECOGNITION SYSTEM USING CONVOLUTIONAL NEURAL NETWORK

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Abstract : Indian currency recognition system using image processing technique used to accurately identify bank notes. The system focuses on recognizing paper currency by analysing images or photographs of the notes, specifically targeting the Indian rupee. It operates by first determining the currency's country of origin through predefined areas of interest, followed by extracting the denomination based on key characteristics such as size, color, and printed text. The methodology is designed to handle the complexities of distinguishing between various methods, the system is capable of quickly and accurately identifying currency notes, thereby facilitating smoother transactions and reducing the potential for errors in currency recognition. This approach not only streamlines the counting of mixed denomination notes but also contributes to the broader application of automated currency recognition system in banking and financial services.

Keywords: Indian currency recognition, shape recognition, feature extraction, Digit recognition, CNN

1. INTRODUCTION

Currency recognition system using image processing is very necessity where approximately 62 million people are visually impaired, including 8 million who are completely blind. These individuals face significant challenges when handling currency, making an efficient currency recognition system for their independence in financial transactions.

The proposed system focuses on identifying the Indian Rupee using advanced image processing methodologies. By leveraging the distinct features of Indian banknotes, including security marks, serial numbers, and color components, the system aims to provide accurate and swift recognition of different denominations such as Rs 5, 10, 20, 50, 100, 500, 1000 and 2000. The project addresses the complexities involved in recognizing currency notes, especially given that various denominations may share similar physical attributes. Through the application of digital processing techniques, this system not only enhances the efficiency of currency recognition but also contributes to fight against counterfeiting, ensuring the integrity of financial transactions in the modern economy. By developing a user-friendly interface, this project empowers visually impaired individuals and facilitates smoother money exchange for all users.

2. LITERATURE SURVEY:

- . **Extracting Region of interest using image processing (Jain et al):** Obtain a scanned image of the currency note at specific resolution, then use filtering methods to extract the denomination value based on different pixel levels in various denominations.
- . **Verifying Indian currency using security features (Mirza and Nande):** Use four security features of Indian currency notes-identification mark, security thread, latent image and watermark to validate authenticity. They extract these hidden features from the currency image.
- . **Surveying development in currency recognition (Chakraborty et al):** Provide a comprehensive survey of recent advancements in currency denomination identification techniques used globally. They discuss the different steps involved-image acquisition, feature extraction and classification algorithms.
- . **Heuristic analysis of serial numbers (Reel et al):** Performs heuristic analysis of characters and serial numbers on Indian currency images to extract features invariant to font type, deformations etc. This is crucial for robust character recognition.
- . **Comparing currency recognition methods (Pawade et al):** Discuss both coin and paper currency recognition techniques based on image processing. They tabulate the advantages and limitations of various methods in terms of accuracy, speed and efficiency. Handling worn or damaged notes remains a challenge.
- . **Extracting Indian currency features(Krishnan):** Indian currency feature extraction involving scanning, binarization, thresholding, morphological filtering and word segmentation, character segmentation can sometimes join letters.
- . **Recognizing Indian currency features using neural networks (Danti and Nayak):** Extract denomination, governor declaration, year of print, serial number etc using a 3x3 grid method. They use neural network to determination and OCR for year of print. Experiments on a large dataset validate the efficiency of their approach.

3. EXISTING SYSTEM:

The existing Indian currency recognition using image processing employ various techniques to identify and verify systems for currency notes. These systems typically involve image acquisition, preprocessing, feature extraction, classification and verification steps. The drawback is the high cost associated with the original note detection system, which are primarily used in banks. These systems are not accessible to common people. The existing systems may not be able to handle damaged, blurry or complex designed currency notes effectively. The task of currency recognition becomes increasingly difficult when dealing with such challenging conditions, highlighting the need for robust and adaptive algorithms. This system typically employ a combination of image processing, feature extraction and classification techniques. Initially currency images are preprocessed to enhance , clarity and reduce noise, often through grayscale conversion and noise reduction, where the existing

system are not so effective because they did not capture intricate visual details and robust to variations in lighting and minor damages such as folds or tears.

4. PROPOSED SYSTEM

The proposed system of Indian currency recognition system focuses on leveraging advanced deep learning techniques to improve accuracy, robustness and speed. This system aims to overcome the limitations of traditional image processing by incorporating Convolutional Neural Network(CNN) and other deep learning methods, which can automatically learn complex patterns and features from currency notes without relying on handcrafted feature extraction. The proposed system typically begins with image processing steps, including noise reduction, and normalization to ensure consistent input quality. Following this, a CNN-based model is used to extract high-level features such as unique symbols, text and security patterns directly from the images. CNNs are effective because they can capture intricate visual details and robust to variations in lighting, orientation and minor damages such as folds or tears.

5. PROBLEM STATEMENT:

Indian currency recognition system using image processing addresses the challenges faced in accurately identifying and verifying currency notes in a context where counterfeit currency is prevalent and where visually impaired individuals struggle to recognize denominations. Existing methods often fall short due to the complexities involved in distinguishing between different denominations, especially when notes are worn, damaged or exhibit similar physical characteristics. The proposed system aims to leverage advanced image processing techniques to automate the recognition process, utilizing features such as size, color, and security elements embedded in the currency notes. This project not only aims to improve the efficiency of currency handling but also strives to empower visually impaired individuals, contributing to greater financial independence and security.

6. METHODOLOGY

The methodology for the Indian currency recognition system using image processing involves several key steps. Initially, the system requires the input of an image of the currency note to enhance the quality of the input image, making it suitable for analysis. Techniques such as filtering, resizing and converting the image to grayscale employed to improve clarity and remove noise. Once the image is pre-processed, the next step is to extract features from the currency note. This includes identifying the Region of Interest(ROI), which focuses on specific areas of the note that contain critical information such as denomination, security features and textual elements. The system analyses characteristics like size, color, and printed text to differentiate between various denominations of Indian currency. After feature extraction, the system utilizes pattern recognition algorithms to classify the currency and compare the extracted features with a database of known currency characteristics. This allows the system to determine the currency's denomination and validate its authenticity. Finally,

the results, including the identified currency, denomination and its value, are displayed on the user interface , completing the recognition process.

7. IMPLEMENTATION AND RESULT:

The implementation of the Indian currency recognition using image processing begins with the Image acquisition, where a digital image of currency is captured. Once the image is obtained, it undergoes pre-processing, which involves converting the image to grayscale, reducing noise, and enhancing important features to improve recognition accuracy, After pre-processing the system extracts key characteristics from the image, such as logos, serial numbers and denomination. This is typically achieved using advanced techniques which help in distinguishing between different notes based on their unique features which will enhance the quality of image by noise removal. The system provides with feature extracting if the template matches with the uploaded currency, it displays the denomination value, if it doesn't matches it displays the counterfeit notes. Overall the result is achieved.

8. CONCLUSION

Indian currency recognition system using image processing offers an effective solution for accurately identifying and verifying Indian rupee note. This system is particularly beneficial for visually impaired individuals, enabling them to handle currency independently while also addressing the issue of counterfeit currency. By implementing a structured methodology that includes image acquisition, pre-processing, feature extraction, the system effectively analyzes critical characteristics of currency notes. It provide real-time exchange information and user-friendly interfaces. It demonstrates the potential of technology to enhance financial security, improve user experience. By leveraging advanced image processing techniques for identifying Indian currency notes.

9. FUTURE SCOPE

The future scope of the proposed currency recognition system using image processing can be expanded in several directions to enhance its functionality and applicability. One significant avenue is the integration of the system with mobile application, providing users with a conventional tool for identifying denominations, which would be particularly beneficial for visually impaired individuals. Implementing a user feedback mechanism would allow users to report inaccuracies or suggest improvements, contributing to continuous recognition. Additionally, focusing on accessibility features such as voice-guided instructions and haptic feedback for visually impaired users, would enhance their interaction with the system.

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BIBLIOGRAPHY

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