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Indian Currency Note Recognition for Visually Impaired with Audio Feedback

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Abstract: Handling Indian currency notes can be challenging for visually impaired individuals, who may require assistance to identify different denominations. This paper presents an Indian currency note recognition system with audio feedback designed to support independent currency identification. The proposed system uses image processing and a Convolutional Neural Network (CNN) to classify Indian currency notes into different denominations. The recognized denomination is communicated through audio feedback, enabling users to identify notes without relying solely on visual inspection. The system is intended to provide a practical and accessible solution for everyday financial transactions. Its performance depends on image quality, lighting conditions, dataset diversity, and model classification accuracy. The proposed approach aims to improve accessibility and independence for visually impaired users.

Keywords: Indian Currency Note Recognition, Visual Impairment Assistance, Deep Learning, Convolutional Neural Network (CNN), Computer Vision, Image Classification, Audio Feedback System, Text-to-Speech (TTS), Assistive Technology, Real-Time Currency Detection, Accessibility System, Smart Assistive Application, Financial Independence, Mobile-Based Recognition System, Embedded Systems.

I. INTRODUCTION

Currency identification is an essential part of everyday financial activities, including shopping, making payments, and handling cash. Although people with normal vision can easily distinguish currency denominations, visually impaired individuals may face difficulties identifying different Indian currency notes accurately. This challenge can lead to dependence on others during financial transactions and may affect their independence and confidence in managing money.

The advancement of image processing and artificial intelligence, automated currency recognition systems can provide an effective solution to this problem. Image processing techniques help extract useful visual information from currency note images, while deep learning methods, particularly Convolutional Neural Networks (CNNs), can learn image features and classify notes into their respective denominations. These technologies can be used to develop systems that recognize currency notes and communicate the results through audio feedback.

This paper presents an Indian currency note recognition system designed to assist visually impaired individuals in identifying different denominations. The system uses a CNN-based approach to classify currency note images and provides audio feedback to announce the predicted denomination. The intended design aims to offer a simple, accessible, and practical solution for everyday currency identification.

The system considers six Indian currency denominations: Rs. 10, Rs. 20, Rs. 50, Rs. 100, Rs. 200, and Rs. 500. Its effectiveness depends on the quality and diversity of the dataset, image conditions, and classification performance. The proposed approach aims to support greater independence for visually impaired users by combining automated image classification with spoken output.

II. LITERATURE SURVEY

[1] Cash Eye – Currency Detection for Blind People Using Machine Learning (2026)

A. Soam, V. Tyagi, H. Rastogi, A. Jaishwal, and A. Gupta developed a system titled "Cash Eye – Currency Detection for Blind People Using Machine Learning." The study focuses on helping visually impaired individuals identify currency denominations independently using image processing and machine-learning techniques. Currency images captured

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through a camera can be preprocessed to improve their quality before classification. A trained model analyzes the visual characteristics of the banknotes and distinguishes between different denominations. Text-to-speech technology can then communicate the identified value through audio output. This approach demonstrates how machine learning and voice feedback can be combined to support independent financial transactions and reduce dependence on others.

[2] Real-Time Currency Detection and Voice Feedback for Visually Impaired Individuals (2025)
S. A. Shreya, M. D. A. I. Siddique, and S. Tasnim presented a real-time currency recognition system that combines image processing, machine learning, and voice feedback. The system captures currency images using a camera and analyzes visual characteristics such as colours, printed values, patterns, and textures to identify the denomination. The study emphasizes the importance of processing speed and recognition performance under varying lighting conditions, note orientations, and image-quality conditions. Once the denomination is identified, text-to-speech technology announces the result to the user. This method highlights the value of immediate audio feedback in assistive applications and provides a useful reference for developing a convenient currency recognition system.

[3] Blind Assist System for Currency Recognition Using Sequential CNN (2025)
J. L. Mathew and co-authors proposed a currency recognition system based on a Sequential Convolutional Neural Network (CNN). CNNs are useful for image classification because they learn relevant visual features directly from training images, reducing the need for manually designed features. The model is intended to distinguish currency denominations by learning the patterns and characteristics present in banknote images. The study also considers variations such as rotated, folded, and partially damaged notes. After classification, the recognized denomination can be communicated through text-to-speech output. This research is relevant to the proposed project because it demonstrates the application of CNN-based classification and audio feedback for improving currency identification accessibility.

[4] Real-World Mapping Model for Visually Impaired People (2025)
A. Rehan, S. Fazal, T. Naseem, and A. A. Zeb investigated a real-world mapping model designed to assist visually impaired individuals in understanding their surroundings. The research focuses on processing environmental information to help users recognize nearby objects, pathways, obstacles, and relevant locations. The information can be communicated through audio instructions, allowing users to receive guidance without depending on visual displays. Although the main focus is environmental awareness rather than currency denomination classification, the study demonstrates the broader importance of assistive technologies that convert visual information into accessible feedback. Its approach is relevant to the proposed project because both systems aim to improve independence and confidence through technology-assisted information delivery.

[5] Accessibility of Financial Applications for People with Visual Impairment: A Scoping Review (2025)
L. Puli, T. Kanij, L. Kooijman, C. Hartel, A. Z. M. Shahriar, and K. Rotaru examined the accessibility of digital financial applications for people with visual impairments. Their review considers barriers that may arise when users access digital banking services and perform financial activities independently. These include difficulties with screen-reader compatibility, navigation, authentication, password entry, and online payments. Such barriers can affect users' privacy, confidence, and ability to manage their finances without assistance. This research provides a broader perspective on financial accessibility and emphasizes the importance of designing technology around users' needs. The proposed currency recognition project addresses a related challenge by making the denomination of a banknote available through audio feedback.

[6] Innovative Currency Identifier for the Blind Using Deep Learning (2024)
R. Maganti, J. Gutla, Y. Mallampalli, and Y. Sandeep presented a currency identification system that uses deep-learning techniques to help visually impaired people recognize banknotes. The approach analyzes images to learn distinguishing features such as colours, symbols, patterns, and printed numerical values. Training with suitable currency images allows the model to identify different denominations based on their visual characteristics. The study also considers practical conditions, including poor lighting, cluttered backgrounds, and changes in note position, which can influence recognition performance. Audio feedback is used to make the result accessible to users. This work is relevant to the proposed system because it combines automated image analysis with spoken output for independent currency identification.

[7] YOLOv9-Based Smart Glasses for Real-Time Recognition of Currency Notes (2024)
M. Khalid, H. B. Ul Haq, Z. Janjua, H. M. M. Akhtar, and H. M. Yousaf proposed a wearable currency recognition system using smart glasses and the YOLOv9 object-detection model. The camera integrated into the wearable device captures visual information, which is processed to identify currency notes and their denominations. The model analyzes features such as printed numbers, symbols, colours, and patterns to support recognition. Once a note is detected, audio output can communicate its value through a speaker or earphones. The wearable design aims to make currency



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identification more convenient during daily activities. This study illustrates an alternative hardware approach to assistive currency recognition, while the proposed project focuses on a CNN-based system with audio feedback.

[8] Enabling Visual Independence: Image Processing for Currency Recognition in the Visually Impaired Community (2024)

B. S. Panda, D. T. Devi, N. Asritha, G. S. Harish, and G. A. S. Varma explored image-processing techniques for recognizing currency among visually impaired users. The research addresses the difficulty of distinguishing denominations during everyday activities such as shopping, making payments, and checking change. Image processing provides a way to examine visual information in a banknote, including its colours, patterns, symbols, shapes, and printed values. Appropriate processing can help prepare currency images for further analysis and classification. The study highlights how computer-based image interpretation can support accessibility. In the proposed project, image preprocessing is similarly used to prepare input images before the CNN predicts one of the six supported Indian currency denominations.

[9] Currency Detector for Visually Impaired (2023)

G. Adiline Macriga and co-authors presented a currency detection system intended to help visually impaired individuals recognize banknotes independently. The study addresses the challenges of identifying currency during shopping, making payments, and verifying change. The system uses image-based processing to examine a banknote and determine its denomination from the available visual information. Such a solution can reduce the need to ask another person to identify a note and can improve convenience during financial transactions. The research demonstrates the practical role of automated currency detection in assistive technology. It is related to the proposed project because both systems use currency images as input and aim to provide useful denomination information to visually impaired users.

[10] Currency Recognition for the Visually Impaired People (2022)

A. C. S. Abilash and co-authors investigated a technological approach to help visually impaired people recognize currency denominations. The study highlights that printed numbers, colours, and other visual patterns may not be easily accessible to users who cannot rely on sight. An automated recognition system can process banknote images and use their distinguishing features to determine the denomination. Such technology may support everyday financial activities, including purchasing goods, paying bills, and checking the change received. The work reinforces the need for accessible and reliable currency identification solutions. The proposed project follows the same broad objective by applying image classification and providing the predicted denomination through audio feedback.

[11] Indian Currency Recognition: A Lightweight Transfer Learning Approach for Visually Impaired (2022)

P. Saini and co-authors explored transfer learning for Indian currency recognition. Transfer learning uses knowledge learned by a model during an earlier training task and adapts it to a new classification problem. This approach may reduce the amount of training required compared with building and training a model entirely from scratch. It is especially relevant when developing recognition systems that need to operate with limited computing resources. For currency recognition, the adapted model can learn to distinguish denominations from their visual features. This research provides a useful comparison with the proposed CNN approach and highlights the importance of choosing an appropriate model architecture, dataset, and computational setup for practical assistive applications.

[12] IPCRF: An End-to-End Indian Paper Currency Recognition Framework for Blind and Visually Impaired People (2022)

M. Singh, J. Chauhan, M. S. Kanroo, S. Verma, and P. Goyal introduced the Indian Paper Currency Recognition Framework (IPCRF). The framework aims to support independent currency identification through an organized process that begins with image input and continues through image analysis and denomination classification. The system examines visual characteristics such as colours, patterns, symbols, and printed numerical values to distinguish between different Indian banknotes. An end-to-end framework helps connect the stages of image acquisition, processing, and recognition into a unified workflow. This study is relevant to the proposed project because the project also follows a structured pipeline in which currency images are processed by a trained CNN and converted into denomination predictions.

[13] Currency Detection App for Blind People Using MIT App Inventor (2022)

S. V. Tresa Sangeetha and co-authors developed a mobile application concept for currency detection using MIT App Inventor. This platform provides a visual, block-based programming environment for building mobile applications. The research focuses on using smartphone technology to make currency identification more accessible to visually impaired users. A mobile application can use a phone's camera to obtain currency images and provide an interface through which recognition results are communicated. The approach demonstrates how accessible application development tools can be

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used to create assistive solutions without requiring a highly complex software-development process. Compared with a mobile-app-based approach, the proposed project explores CNN-based classification and audio feedback within its currency recognition workflow.

[14] Construction of Indian Currency Identifier for Visually Impaired (2022)
K. Thakur and co-authors presented a currency identifier designed to assist visually impaired people in recognizing Indian banknotes. The research addresses the challenges of identifying different denominations during daily financial activities. A currency identification system can capture a banknote image and process its visual characteristics, including colours, patterns, symbols, and printed numerical values. These features can then be used by a classification method to distinguish between denominations. The study highlights the role of automated recognition in reducing dependence on others and improving users' confidence during transactions. It provides background for the proposed project, which similarly processes currency images and uses a trained model to determine the denomination before providing the result to the user.

[15] Voice Enabled Application for the Visually-Impaired to Detect and Recognize Indian Currency in Hindi and English Using Deep Learning (2022)
B. Nigam and A. Saggar proposed a voice-enabled application that uses deep learning to recognize Indian currency and communicate the result in Hindi and English. The system is designed to help visually impaired individuals identify currency without relying on printed denomination labels or visual displays. Currency images are analyzed using a deep-learning model that learns relevant visual characteristics, such as colours, patterns, symbols, and printed values. The recognized denomination is then presented through voice output. Support for two languages can make the system more accessible to users with different language preferences. This research is particularly relevant to the proposed project because it combines deep-learning-based currency recognition with spoken output, while also suggesting multilingual feedback as a possible future enhancement.

[16] A Raspberry Pi Based CNN Model for Indian Currency Detection for Visually Impaired People (2022)
R. Vishwasi and co-authors proposed a currency detection system that combines a Raspberry Pi single-board computer with a Convolutional Neural Network. The system is intended to provide a compact solution for identifying Indian currency denominations. A camera captures the banknote image, and the CNN analyzes the image to classify the note. Using an embedded computing platform offers an alternative to relying on a conventional desktop computer and supports the development of portable assistive devices. The study is relevant to the proposed project because both approaches use CNN-based image classification to recognize currency. It also illustrates the importance of considering the processing capabilities of the target hardware when designing an embedded recognition system.

[17] VirtualEye: Android Application for the Visually Impaired (2021)
J. Bagrecha and co-authors presented VirtualEye, an Android application designed to assist visually impaired individuals with everyday activities. Smartphones provide useful features for assistive applications, including cameras, processing capabilities, and audio output. An application can capture visual information, process it using suitable recognition techniques, and communicate the results through voice feedback. This reduces the need for users to depend on visual interfaces when interacting with the system. Although the work covers broader assistive functionality rather than focusing exclusively on currency recognition, it demonstrates the value of combining mobile technology with accessible output. The proposed project applies a similar principle to a specific task: identifying Indian currency denominations and communicating the result through audio.

[18] Currency Recognition App for Visually Impaired Users in India (2021)
G. Bhutkar and co-authors examined a currency recognition application intended to help visually impaired individuals identify Indian banknotes. The study focuses on the difficulties users may encounter when distinguishing denominations during purchases, payments, and checking the change received. A smartphone-based application can capture a banknote image and analyze its visual characteristics to identify the currency value. Such an application can make recognition more convenient by using a device that many users already carry. The work highlights the importance of user-friendly design and independent access to currency information. The proposed project addresses the same need by applying image classification and providing an audio announcement of the predicted denomination.

[19] Divya-Drishti: An Independent Aid for the Visually Impaired (2021)
J. Jhaveri, A. Gupta, P. Chhabria, N. Ochani, and S. Sengupta presented Divya-Drishti, an assistive system designed to support visually impaired individuals in performing everyday activities. The system combines smartphone technology, a Raspberry Pi-based platform, artificial intelligence, image processing, and voice interaction. Its described functions include currency detection, bill reading, optical character recognition, text summarization, colour detection, and mask

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detection. Users can capture images and request information through voice commands, allowing the system to communicate useful information without depending entirely on visual displays. This study demonstrates the potential of integrating multiple assistive functions into a single platform. The proposed project adopts a more focused approach by concentrating on currency denomination recognition and audio feedback.

[20] An IoT Application for Indian Currency Recognition in Vernacular Languages for Visually Challenged People (2017)

L. Puli, T. Kanij, L. Kooijman, C. Hartel, A. Z. M. Shahriar, and K. Rotaru conducted a scoping review of the accessibility of financial applications for people with visual impairments. The review discusses barriers that may affect independent use of digital financial services, including inaccessible navigation, screen-reader compatibility, authentication procedures, password entry, and online payment processes. These issues demonstrate that financial independence depends not only on the availability of technology but also on whether that technology is accessible and convenient to use. The findings provide a broader context for assistive financial tools. The proposed currency recognition system contributes to this area by making banknote denomination information available through spoken output, helping users perform cash transactions with greater independence.

The reviewed studies demonstrate the use of image processing, machine learning, Convolutional Neural Networks, deep learning, transfer learning, mobile applications, wearable devices, and embedded computing platforms to support visually impaired individuals. Several approaches focus on identifying currency from images, while others explore voice-based interaction and broader assistive functions. These studies show that audio feedback is an important feature because it allows recognition results to be communicated without requiring users to read a visual display.

III. SYSTEM ARCHITECTURE AND METHODOLOGY

The proposed Indian Currency Note Recognition System for Visually Impaired Individuals with Audio Feedback is designed to identify Indian currency denominations and communicate the result through spoken information. The system uses image processing and a Convolutional Neural Network (CNN) to classify currency images into six denominations: ₹10, ₹20, ₹50, ₹100, ₹200, and ₹500. The main components of the system include the currency image input, image preprocessing module, trained CNN model, denomination prediction module, and audio feedback component.

In the current software implementation, stored currency images are provided as input to the trained model. The input images are processed before classification to ensure that they meet the model's input requirements. The CNN analyzes the prepared images and generates prediction scores for the six denomination classes. The denomination with the highest prediction score is selected as the model's output. Finally, the recognized denomination can be converted into speech using a text-to-speech mechanism and delivered through a speaker or headphones.

A. SYSTEM ARCHITECTURE

The proposed system consists of an image input module, an image preprocessing stage, a trained CNN model, a denomination prediction module, and an audio feedback component. In the current software implementation, stored currency images are provided as input to the trained model. The images are resized and processed before classification. The CNN generates prediction scores for the six denomination classes, and the class with the highest score is selected as the predicted denomination.

The intended hardware implementation uses an ESP32-S3 Sense module with a camera for image acquisition. A push button can be used to initiate image capture, while a speaker or headphones can communicate the recognized denomination through audio feedback. These hardware components form the proposed system architecture and require hardware-level integration and testing before their operation can be considered experimentally validated.

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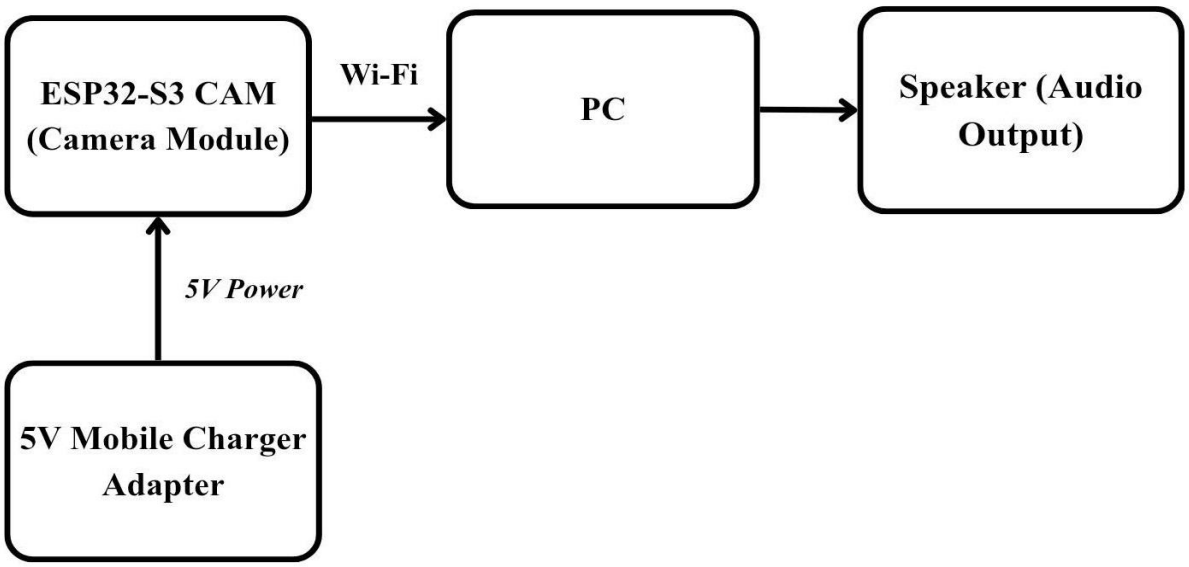


Fig. 1 Block Diagram of the Proposed Indian Currency Note Recognition System

B. OPERATIONAL WORKFLOW OF THE PROPOSED SYSTEM

The proposed Indian Currency Note Recognition System follows a systematic software workflow for identifying Indian currency denominations using a Convolutional Neural Network (CNN). Initially, a currency note image is loaded from the prepared dataset or test-image folder. The input image is resized to the required dimensions and pre-processed using the same procedure adopted during model training. The pre-processed image is then fed into the trained CNN model for classification.

The CNN model generates prediction scores for six Indian currency denominations, namely ₹10, ₹20, ₹50, ₹100, ₹200, and ₹500. The denomination corresponding to the highest prediction score is selected as the predicted output. During evaluation, the predicted denomination is compared with the actual class label to determine the correctness of the classification.

In the proposed assistive application, the predicted denomination can be mapped to a corresponding spoken message through a text-to-speech module. The audio output is intended to be delivered through a speaker or headphones to assist visually impaired individuals in identifying currency notes. The integration of audio feedback and embedded hardware requires implementation and experimental validation.

The system follows a sequence of operations beginning with currency image input and ending with audio feedback. First, a currency image is supplied to the system. The image is then resized and pr- processed according to the model's requirements. Next, the trained CNN analyzes the image and generates prediction scores for the six denomination classes. The highest-scoring class is selected as the predicted denomination. The result can then be displayed for evaluation and converted into spoken information through the text-to-speech component.

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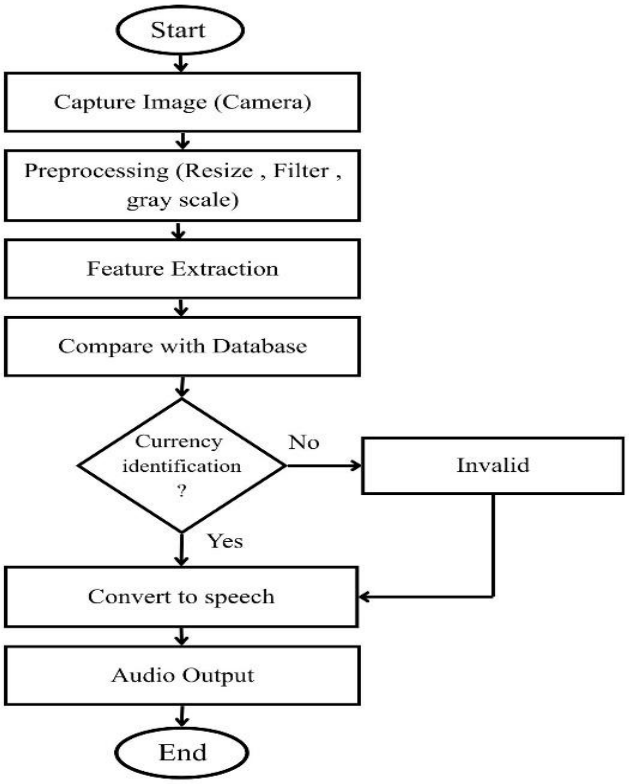


Fig. 2 Flowchart of the Proposed Currency Recognition Methodology

IV. SOFTWARE AND HARDWARE SPECIFICATIONS

A. SOFTWARE SPECIFICATIONS

The software implementation of the proposed Indian Currency Note Recognition System is developed using Python in Visual Studio Code. TensorFlow and Keras are used to develop, train, and evaluate the Convolutional Neural Network (CNN) model. OpenCV is used for image processing, while NumPy supports numerical operations where required. The trained model is saved in Keras format for subsequent testing and currency denomination prediction.

The software workflow accepts stored currency note images as input, preprocesses them, and passes them to the trained CNN model for classification. The model identifies one of six Indian currency denominations: ₹10, ₹20, ₹50, ₹100, ₹200, or ₹500. The predicted output is compared with the actual denomination label during evaluation to assess the model's classification performance.

B. HARDWARE SPECIFICATIONS

The proposed hardware configuration consists of an ESP32-S3 Sense development board with a camera module for capturing currency note images. A push button is intended to initiate image capture, while a Micro SD card may be used to store currency images or related data, depending on the final implementation. A speaker or headphones are proposed for providing audio feedback corresponding to the recognized denomination.

The ESP32-S3 Sense is intended to serve as the processing platform for a portable assistive device. However, integration of the trained CNN model with the embedded board, camera-based image acquisition, and audio output requires implementation and experimental validation. Therefore, these components are described as proposed hardware rather than experimentally verified features of the current Python-based implementation.

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V. DESIGN AND IMPLEMENTATION

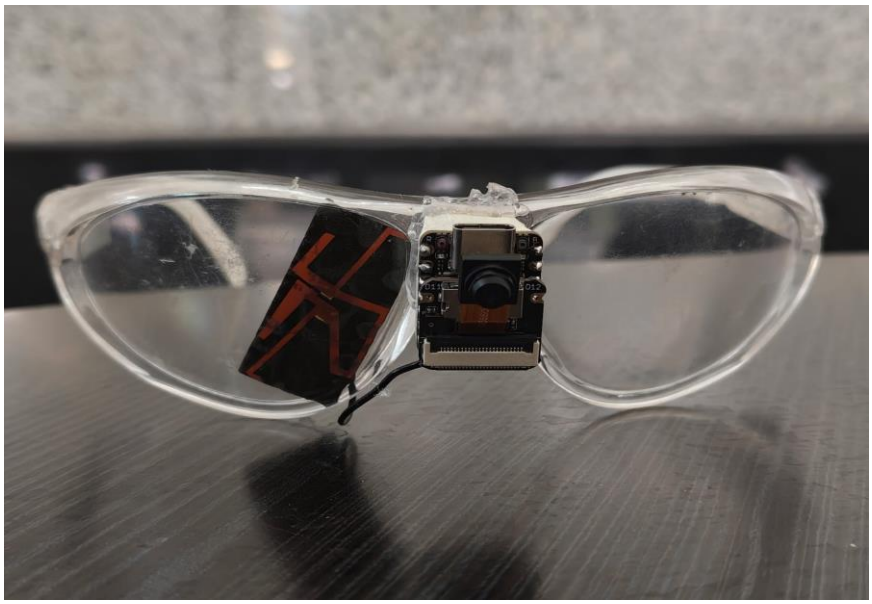


Fig. 3 Hardware Prototype of the Wearable Currency Recognition System

The proposed Indian Currency Note Recognition System for Visually Impaired Individuals is developed using deep learning techniques to classify Indian currency denominations. An external dataset containing approximately 10,446 reference images was explored, and around 4,074 images were downloaded. Additionally, 3,066 real-world currency images were captured using a camera and organised into six categories: ₹10, ₹20, ₹50, ₹100, ₹200, and ₹500. These images help improve recognition under practical conditions, including variations in lighting, orientation, and background.

The collected images are resized to 224 × 224 pixels to meet the input requirements of MobileNetV2. The images are converted from BGR to RGB colour format, consisting of red, green, and blue channels. Before model-specific preprocessing, pixel intensity values range from 0 to 255. This preprocessing ensures consistent image dimensions and colour representation for model input.

The system uses MobileNetV2, a lightweight Convolutional Neural Network (CNN), for currency classification. Transfer learning adapts the pre-trained model to recognise six Indian currency denominations. Fine-tuning further improves its ability to distinguish denominations based on visual features such as colour patterns, printed elements, and numerical markings.

The improved dataset of 3,066 images is divided into 2,453 training images and 613 validation images. Initially, the model achieved approximately 32–40% recognition performance. After adding real-world images and further training, the recorded fine-tuning epoch achieved 84.38% training accuracy and 87.06% validation accuracy. These values represent the recorded epoch results; final test accuracy requires evaluation on an independent test dataset.

The model can be evaluated using a confusion matrix, precision, recall, and F1-score. The proposed system is intended to provide audio feedback through a speaker or headphones by converting the predicted denomination into a spoken message. The wearable prototype consists of spectacles fitted with a camera module, providing a potential platform for capturing currency images. Complete integration of the camera, recognition model, and audio output requires separate testing to demonstrate real-time operation.

VI. RESULT AND DISCUSSION

The proposed Indian Currency Note Recognition System was tested using currency note images from different denominations. The Smart Currency Reader interface displays the input currency image, the prediction confidence, and the scores generated for the six denomination classes: ₹10, ₹20, ₹50, ₹100, ₹200, and ₹500. The system selects the denomination with the highest prediction score and displays the identified currency denomination when a prediction is accepted.

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As shown in Fig. 4, the system identifies different currency denominations, including ₹20, ₹50, ₹100, and ₹500, with varying confidence scores. For example, the displayed results include a confidence score of 89.93% for ₹50, 83.99% for ₹100, and 95.76% for ₹500. These results demonstrate the system's ability to classify several currency note images using the trained deep learning model. The prediction scores vary depending on the input image and the visual features detected by the model.

The results also show that the system sometimes displays “Currency not identified” when the prediction is uncertain. This indicates that the recognition process may be affected by image quality, lighting conditions, note orientation, and similarities between the visual features of different denominations.

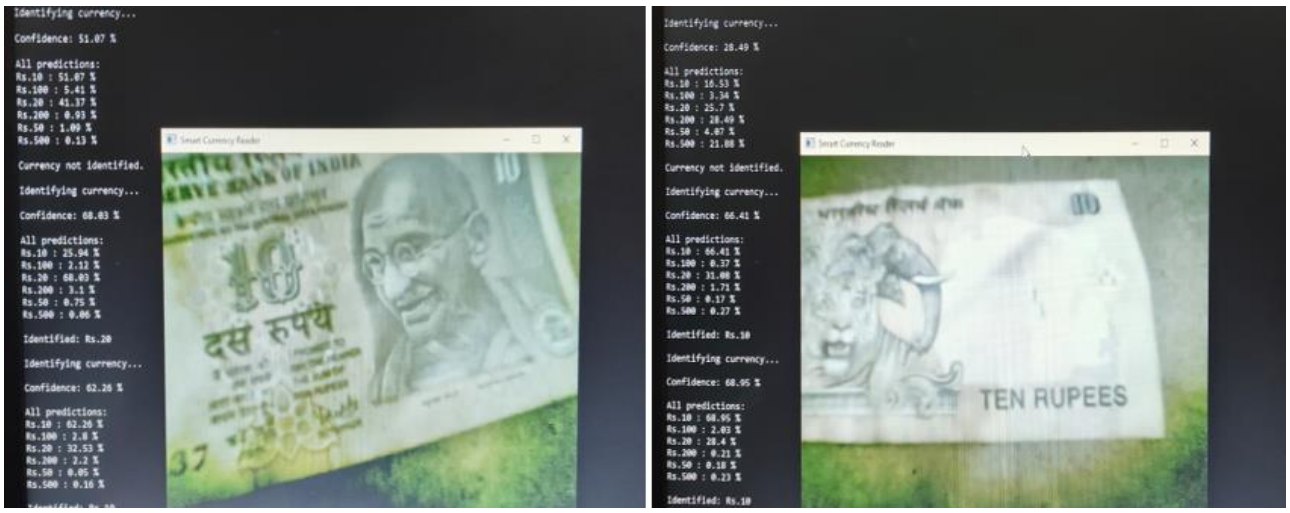


Fig. 4 Currency Recognition Output for ₹10 Note

The above Figure 4 Shows the currency recognition results obtained from the proposed Indian Currency Note Recognition System. The software interface displays the input currency image along with the prediction scores for different denominations. The trained CNN model processes the input image and calculates a confidence score for each denomination. The denomination with the highest prediction score is selected as the output.

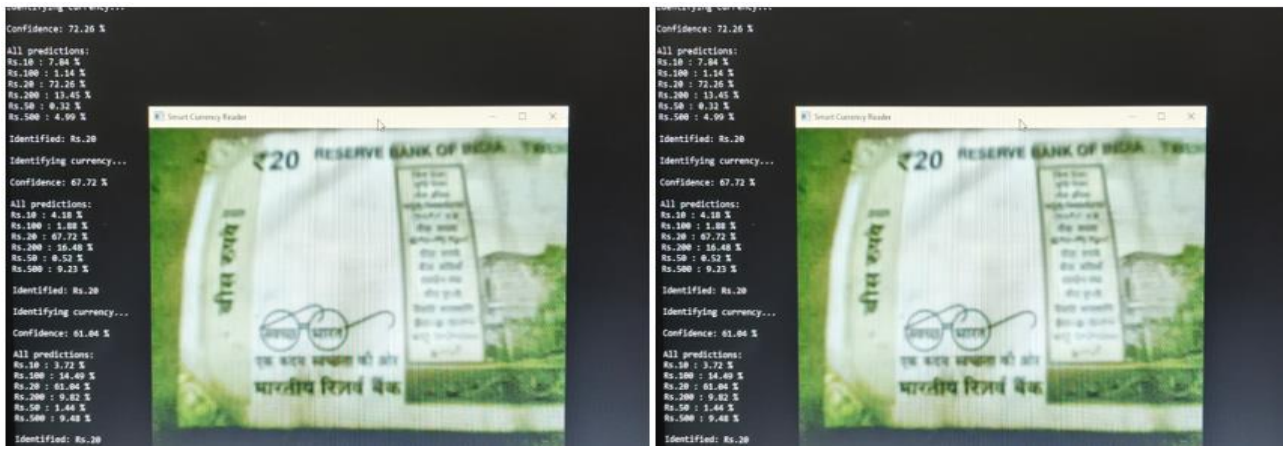


Fig. 5 Currency Recognition Output for ₹20 Note

The above Figure 5 shows the currency recognition result of the proposed system using the trained CNN model. The system processes the input image of an Indian ₹20 currency note and displays it on the monitoring interface. The system identifies the note as ₹20 and displays a confidence score of approximately 72.26% in one prediction attempt. This feature is intended to help visually impaired individuals recognize currency notes without depending entirely on visual assistance. This indicates that the model assigns the highest prediction score to the ₹20 denomination compared with the other classes.

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Fig. 6 Currency Recognition Output for ₹50 Note

The above Figure 6 illustrates the currency recognition results of the proposed Indian Currency Note Recognition System. The Smart Currency Reader interface displays the input currency images and the corresponding recognition results generated by the trained CNN model. In the first image, the system analyzes an Indian ₹50 currency note and successfully identifies its denomination, with confidence scores of approximately 81.97% and 95.98% during successive recognition attempts. This feature is intended to help visually impaired individuals recognize currency notes without depending entirely on visual assistance.



Fig. 7 Currency Recognition Output for ₹100 Note

The above Fig. 7 illustrates the currency recognition results of the proposed Indian Currency Note Recognition System for ₹100 currency notes. The Smart Currency Reader interface displays the input currency images and the corresponding prediction results generated by the trained CNN model. The system analyzes the visual features of the note, including its printed denomination, patterns, and other visible characteristics, to classify the currency. The message “Currency not identified” also appears during one attempt, indicating that the model may not always produce a reliable classification. In the first image, the system identifies the note as ₹100 with a confidence score of approximately 83.99%.

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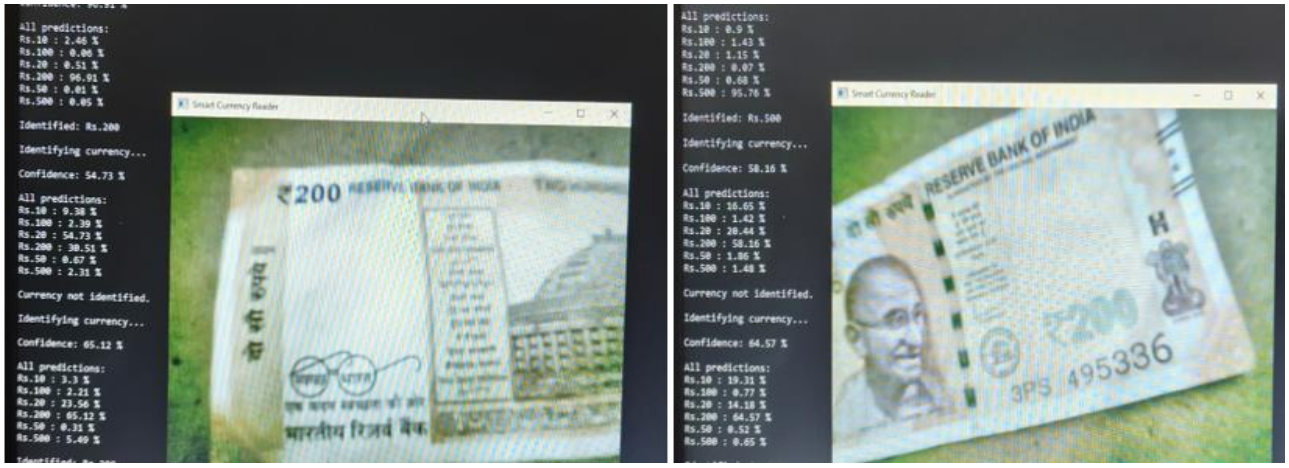


Fig. 8 Currency Recognition Output for ₹100 Note

The above Fig. 8 illustrates the performance of the proposed Indian Currency Note Recognition System in identifying ₹200 and ₹500 currency notes using the trained Convolutional Neural Network (CNN) model. The Smart Currency Reader interface displays the input currency images and the corresponding prediction results generated during the recognition process. In the first image, the system analyzes a ₹200 currency note and identifies its denomination with confidence scores of approximately 96.91%.



Fig. 9 Currency Recognition Output for ₹100 Note

The above Fig. 9 illustrates the performance of the proposed Indian Currency Note Recognition System in identifying ₹500 currency notes using the trained Convolutional Neural Network (CNN) model. The Smart Currency Reader interface displays the input currency images along with the corresponding prediction results generated during the recognition process. In the first image, the system captures a ₹500 currency note and successfully identifies its denomination with confidence scores of 72.34% and 93.67% during different recognition attempts. In another attempt, the confidence score is 52.82%, and the message “Currency not identified” appears

VII. CONCLUSION

The proposed Indian Currency Note Recognition System for Visually Impaired Individuals uses deep learning techniques to identify Indian currency denominations. The system employs MobileNetV2 with transfer learning and fine-tuning to classify six denominations: ₹10, ₹20, ₹50, ₹100, ₹200, and ₹500. The dataset was enhanced with real-world currency images to improve recognition under practical conditions. During the recorded fine-tuning epoch, the model achieved 84.38% training accuracy and 87.06% validation accuracy. The Smart Currency Reader interface displays predicted denominations and their confidence scores for different input images.

The results demonstrate the potential of deep learning-based currency recognition as an assistive technology for visually impaired individuals. Audio feedback is intended to communicate the identified denomination through a speaker or



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headphones, supporting more independent financial transactions. However, further testing using an independent test dataset and improvements in handling variations in lighting, image orientation, and image quality are required. Future development will focus on improving classification reliability and integrating the recognition model with the wearable camera and audio output to support real-time currency identification.

VIII. FUTURE SCOPE

The proposed Indian Currency Note Recognition System can be further improved to enhance its accuracy, reliability, and practical usability for visually impaired individuals. Future development can focus on integrating the trained MobileNetV2 model with the wearable camera prototype to enable real-time currency recognition. The system can also be enhanced by implementing audio feedback in multiple Indian languages, allowing users to hear the identified denomination in their preferred language. Further improvements in dataset diversity and model training can help the system recognise currency notes under different lighting conditions, orientations, backgrounds, and image quality variations. The recognition model can be extended to identify folded, partially damaged, and worn-out currency notes. In addition, lightweight model optimisation and deployment on embedded devices can reduce computational requirements and support portable, offline operation. Future versions may incorporate a simple voice interface, vibration alerts, and a rechargeable power supply to improve accessibility and convenience. These enhancements could make the system more dependable and useful for everyday financial transactions, promoting greater independence and confidence among visually impaired individuals.

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