IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.102 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 8, August 2024

DOI: 10.17148/IJARCCE.2024.13854

Android Application for Blind People Summing Currency Notes

Mohammed Yahab Hussain[1], Parimal Kumar K R[2]

Post-Graduation Student, Department of MCA, Vidya Vikas Institute of Engineering and Technology, Mysore,Karnataka[1].

Assistant Professor, Department of MCA, Vidya Vikas Institute of Engineering and Technology, Mysore, Karnataka[2]

Abstract This research paper introduces a novel Android application designed to assist visually impaired individuals in recognizing and summating Indian currency notes. The application leverages a Convolutional Neural Network (CNN) with the MobileNet architecture, trained on a comprehensive dataset comprising images of 10, 20, 50, 100, 200, 500, and 2000 Indian Rupee notes. The primary functionalities of the application include swipe-based interactions, allowing users to perform currency summation, trigger text-to-speech conversion, and initiate the currency identification process.The development process involves meticulous data preprocessing, model training, and optimization to accommodate the constraints of mobile devices. We address the challenges of real-time currency recognition by implementing features such as audio feedback to inform users of the identified denomination promptly. Additionally, the user interface incorporates accessibility features, including screen reader compatibility and voice command support, ensuring a seamless and intuitive experience for individuals with visual impairments.

Keywords: Include at least 4 keywords or phrases.

I. INTRODUCTION

In an era defined by technological prowess and a commitment to inclusivity, the development of assistive technologies stands as a testament to our collective aspiration for a more accessible world. Among the diverse challenges faced by individuals with visual impairments, the identification and management of currency notes remain formidable obstacles to financial independence. Our research embarks on a journey to address this pressing concern by harnessing the capabilities of deep learning and mobile technology. In particular, we focus on the creation of an Android application utilizing the MobileNet architecture, dedicated to providing a seamless and empowering experience for visually impaired users in recognizing and interacting with Indian currency notes.

Navigating the Landscape of Visual Impairment: Visual impairment affects millions of lives, shaping the daily experiences of individuals who grapple with the nuances of a world primarily designed for sighted individuals. While remarkable strides have been made in voice-assisted technologies, the task of identifying and differentiating currency notes remains a notable challenge. As financial autonomy is intrinsically linked to overall well-being, the absence of a robust, accurate, and user-friendly solution becomes an impediment to the full integration of visually impaired individuals into various aspects of economic life.

Catalyzing Independence through Technology: Motivated by the societal impact of fostering independence, our research endeavors to bridge this gap by crafting a mobile application that transcends traditional boundaries. Grounded in the capabilities of deep learning, specifically the MobileNet architecture, our solution not only recognizes Indian currency notes but also introduces intuitive swipe-based interactions. This innovation aims to redefine the user experience, providing not just a tool but a companion in the form of an accessible application tailored to the unique needs of the visually impaired.

An Inclusive Technological Frontier: The motivation behind our research springs from a commitment to inclusivity, where technology becomes an enabler, dismantling barriers and opening avenues for those traditionally marginalized. Through the lens of deep learning and mobile application development, we seek to empower individuals who have long navigated a world that doesn't always cater to their needs. Our objective is clear – to pioneer an accessible solution that not only recognizes currency notes but also contributes to a broader narrative of empowerment and inclusivity through technology.

DOI: 10.17148/IJARCCE.2024.13854

Crafting a Vision of Accessibility: In pursuit of this vision, our research not only aims to deliver a functional application but also aspires to redefine the very concept of accessibility. We delve into the intricacies of MobileNet architecture, optimizing it for the constraints of mobile devices, ensuring that the resulting application is not only powerful but also practical for everyday use. We navigate the realms of user interface design, audio feedback mechanisms, and privacy considerations to craft an application that resonates with our commitment to providing a solution that is both technically robust and genuinely user-centric.

Motivation: The motivation behind this research lies in the societal impact of empowering individuals with visual impairments to manage their finances autonomously. Financial independence is a crucial aspect of overall well-being, and our application aims to address the unique needs of this demographic by offering a tool that facilitates real-time currency recognition and summation. By providing an intuitive interface and incorporating audio feedback, we aim to enhance the user experience and contribute to the broader goal of fostering inclusivity through technology.

II. PROBLEM STATEMENT

Existing solutions often fall short in providing a comprehensive and user-friendly means of currency identification, leaving a critical gap in the accessibility landscape. The lack of real-time feedback, intuitive interactions, and reliable accuracy exacerbates the difficulties faced by the visually impaired in conducting routine financial transactions, hindering their ability to navigate a world that predominantly operates on visual cues.

III. LITERATURE SURVEY

The literature on Indian currency recognition systems reveals a growing interest in leveraging technology to empower blind and visually impaired individuals in managing their finances. One noteworthy contribution is the work by Singh et al. [1], where an End-to-End Indian Paper Currency Recognition Framework (IPCRF) is proposed. This framework demonstrates a holistic approach to currency recognition, addressing the needs of the visually impaired community. [1]Singh et al.'s study, published in, presents a comprehensive solution that encompasses the entire process of Indian currency recognition, offering end-to-end functionality. The framework not only recognizes different denominations but also caters to the specific requirements of blind and visually impaired users. The inclusion of accessibility features and the emphasis on end-to-end functionality make this framework a noteworthy contribution in the field.In a similar vein, Garkoti et al. [2] present an Indian Currency Recognition System that relies on Image Processing Techniques. This work,delves into the intricacies of image processing to recognize and distinguish various denominations of Indian currency. The study focuses on the application of image processing techniques to enhance the accuracy of currency recognition. The insights provided in this research contribute to the broader understanding of the role of image processing in developing effective currency recognition systems, thereby adding valuable knowledge to the field.Furthermore, Gautam [3] explores Indian currency detection using Image Recognition Techniques, as This study contributes to the growing body of knowledge on currency recognition by specifically addressing the use of image recognition techniques. The research emphasizes the application of advanced computer vision algorithms for accurate currency detection. Gautam's work provides insights into the potential of image recognition techniques for currency-related applications, offering valuable perspectives for researchers and practitioners in the field. The literature on currency recognition systems extends to cover various aspects, including counterfeit detection and additional focus on the needs of visually impaired individuals.

In their work, Murthy et al. [4] present the "Design and Implementation of Paper Currency Recognition with Counterfeit Detection,". The study offers a comprehensive approach to currency recognition by incorporating a counterfeit detection mechanism. The proposed system not only identifies genuine paper currency but also addresses the critical issue of counterfeit notes. This research provides insights into the integration of security features within currency recognition systems, offering a holistic solution to the challenges associated with currency authentication.Sharan, Kaur, and Singh [5] contribute to the field by focusing on the identification of counterfeit Indian currency notes. Their work, delves into the synergies between image processing and machine learning classifiers for counterfeit detection. The study explores the use of advanced technologies to enhance the security aspects of currency recognition systems, thereby contributing to the ongoing efforts to mitigate financial fraud.Another significant contribution comes from CS et al. [6], who address the specific needs of visually impaired individuals in their work on "Currency Recognition for the Visually Impaired People." the research focuses on designing a currency recognition system that caters to the accessibility requirements of the visually impaired. This work underscores the importance of inclusivity in technology, ensuring that currency recognition systems are not only accurate but also user-friendly for individuals with visual impairments.these studies collectively contribute to the multifaceted domain of currency recognition systems. Murthy et al. emphasize the integration of counterfeit detection, adding a layer of security to currency recognition.

DOI: 10.17148/IJARCCE.2024.13854

Sharan, Kaur, and Singh explore the intersection of image processing and machine learning for counterfeit identification, enhancing the robustness of currency recognition systems. CS et al.'s work specifically addresses the accessibility needs of visually impaired individuals, reflecting a broader commitment to inclusivity in the development of such systems. Together, these contributions enrich the literature on currency recognition systems, offering valuable insights into security, technology integration, and accessibility considerations. V. B et al.'s research [7], presented at the 2022 International Conference on Automation, Computing and Renewable Systems (ICACRS), introduces an innovative approach to "Currency and Fake Currency Detection using Machine Learning and Image Processing." The study focuses on developing an application specifically tailored for blind individuals using Android Studio. By integrating machine learning and image processing techniques, the proposed system aims to not only recognize currency but also detect counterfeit notes. The emphasis on accessibility, particularly for blind users, reflects a commitment to inclusive technology solutions.

In a related vein, Patange et al. [8] contribute to the discourse with their work on the "Comprehensive Analysis of Indian Currency Recognition System and Location Tracking for Visually Impaired," presented at the 2021 International Conference on Intelligent Technologies (CONIT). The research offers a holistic perspective by not only addressing currency recognition but also incorporating location tracking functionalities. This comprehensive approach aims to enhance the overall mobility and independence of visually impaired individuals, making it a significant step towards creating a more inclusive technological ecosystem.Swami et al.'s study [9] explores "Indian Currency Classification Using Deep Learning Techniques," This work delves into the application of deep learning techniques for currency classification, reflecting the evolving trends in utilizing advanced neural networks for accurate and efficient recognition. The study adds depth to the ongoing discourse on leveraging deep learning for currency-related applications.Mittal and Mittal [10] contribute to the literature with their research on "Indian Banknote Recognition using Convolutional Neural Network," presented at the Their work specifically focuses on the utilization of Convolutional Neural Networks (CNN) for Indian banknote recognition. CNNs, known for their effectiveness in image-related tasks, offer a powerful tool for accurate currency recognition, as demonstrated by the Mittals' study.these recent contributions collectively enrich the literature on currency recognition systems. The studies exhibit a diverse range of approaches, including the integration of machine learning and image processing for currency and counterfeit detection, the comprehensive analysis of recognition systems with location tracking for visually impaired individuals, and the application of advanced deep learning techniques such as CNNs for accurate currency classification. As technology continues to evolve, these studies pave the way for more sophisticated and inclusive solutions, furthering the goal of providing accessible and accurate currency recognition systems for a broader user base.

IV. METHODOLOGY

The development of the Android currency recognition application for the visually impaired involves a meticulous step-by-step methodology. Initially, a comprehensive analysis of requirements is conducted, outlining essential functionalities such as swipe gestures, real-time feedback, and text-to-speech capabilities, with a special emphasis on features catering to the needs of visually impaired users. Following this, a diverse dataset of Indian currency notes is acquired, covering various denominations and accounting for diverse lighting conditions and orientations. The dataset undergoes preprocessing, including resizing, pixel value normalization, and data augmentation, to optimize it for training a deep learning model. The selection of an appropriate deep learning architecture, such as MobileNet, is a crucial step, considering its efficiency and suitability for deployment on mobile devices.

The chosen model is then trained on the preprocessed dataset to recognize and distinguish between different Indian currency notes.Subsequently, the Android application is designed, integrating the trained model to enable real-time currency recognition. The user interface is crafted with features like swipe gestures, fostering an intuitive and accessible interaction for visually impaired users. Accessibility features, including text-to-speech conversion, are implemented to enhance the user experience. Iterative testing is a key aspect of the methodology, involving continuous refinement based on user feedback. Throughout the development process, a commitment to inclusivity and user-centric design guides the implementation of features, ensuring the application aligns with the unique needs of visually impaired individuals. This detailed methodology provides a structured approach to the project, combining robust model training with thoughtful application design to deliver an effective and accessible solution for currency recognition.

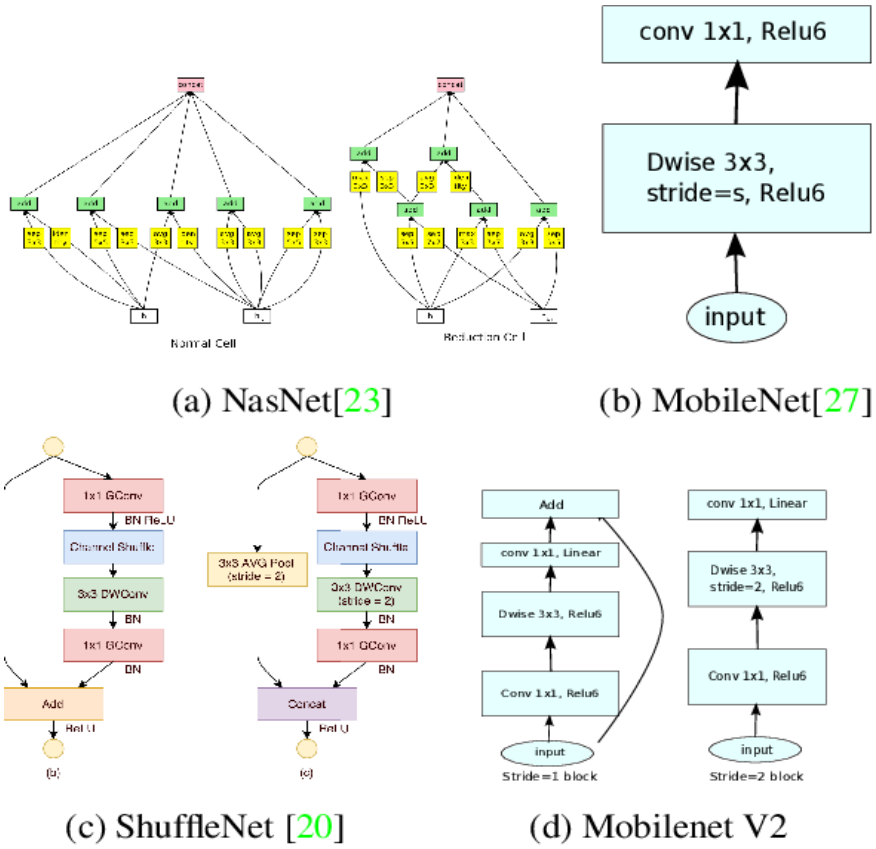
IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.102 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 8, August 2024

DOI: 10.17148/IJARCCE.2024.13854

Mobilenet:



MobileNet is a highly efficient and lightweight deep learning architecture specifically designed for mobile and embedded vision applications. Developed by Google, MobileNet addresses the challenges of deploying complex neural networks on resource-constrained devices. What sets MobileNet apart is its use of depthwise separable convolutions, which significantly reduces the computational load compared to traditional convolutional layers. This separation into depthwise and pointwise convolutions enables a drastic reduction in the number of parameters, making MobileNet well-suited for real-time applications on devices with limited processing power, such as mobile phones. Its architecture strikes a balance between accuracy and efficiency, making it an ideal choice for image classification tasks, including currency recognition in the context of our Android application for the visually impaired. The streamlined architecture ensures that the model can be seamlessly integrated into the mobile environment, providing swift and accurate recognition of Indian currency notes while catering to the unique needs of users with visual impairments.

V. CONCLUSION

In the journey to develop an Android currency recognition application tailored for the visually impaired, we have traversed a path of innovation and inclusivity. The integration of MobileNet architecture, known for its efficiency and suitability for mobile deployment, has been a pivotal choice in realizing the project's objectives. The methodology encompassed a meticulous process, from requirement analysis to dataset acquisition, preprocessing, and the selection of an appropriate deep learning model.

The application's emphasis on user-centric design, with features like swipe gestures, real-time feedback, and text-to-speech capabilities, reflects a commitment to inclusivity and accessibility. The MobileNet architecture, optimized for the recognition of Indian currency notes, ensures that the model operates seamlessly within the constraints of mobile devices. The integration of accessibility features and the continuous refinement based on iterative testing contribute to the overall usability and effectiveness of the application.

As a result, the Android application stands not only as a technological solution for currency recognition but as a beacon of empowerment for visually impaired individuals. By providing an intuitive and accessible tool, we aim to foster financial independence and bridge the gap between technology and inclusivity.

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.102 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 8, August 2024

DOI: 10.17148/IJARCCE.2024.13854

The journey does not end here; it extends to a future where advancements in assistive technologies continue to break barriers and create a more inclusive world for individuals with visual impairments. This project represents a small yet impactful step towards that vision, showcasing the potential of technology to make a meaningful difference in the lives of those who need it most.

REFERENCES

[1]. M. Singh, J. Chauhan, M. S. Kanroo, S. Verma and P. Goyal, "IPCRF: An End-to-End Indian Paper Currency Recognition Framework for Blind and Visually Impaired People," in IEEE Access, vol. 10, pp. 90726-90744, 2022, doi: 10.1109/ACCESS.2022.3202007.

[2]. P. Garkoti, P. Mishra, N. Rakesh, Payal, M. Kaur and P. Nand, "Indian Currency Recognition System Using Image Processing Techniques," 2022 9th International Conference on Computing for Sustainable Global Development (INDIACom), New Delhi, India, 2022, pp. 628-631, doi: 10.23919/INDIACom54597.2022.9763134.

[3]. K. Gautam, "Indian Currency Detection using Image Recognition Technique," 2020 International Conference on Computer Science, Engineering and Applications (ICCSEA), Gunupur, India, 2020, pp. 1-5, doi: 10.1109/ICCSEA49143.2020.9132955.

[4]. Abburu, S. Gupta, S. R. Rimitha, M. Mulimani and S. G. Koolagudi, "Currency recognition system using image processing," 2017 Tenth International Conference on Contemporary Computing (IC3), Noida, India, 2017, pp. 1-6, doi: 10.1109/IC3.2017.8284300.

[5]. S. Murthy, J. Kurumathur and B. R. Reddy, "Design and implementation of paper currency recognition with counterfeit detection," 2016 Online International Conference on Green Engineering and Technologies (IC-GET), Coimbatore, India, 2016, pp. 1-6, doi: 10.1109/GET.2016.7916838.

[6]. Sharan, A. Kaur and P. Singh, "Identification of Counterfeit Indian Currency Note using Image Processing and Machine Learning Classifiers," 2023 Third International Conference on Artificial Intelligence and Smart Energy (ICAIS), Coimbatore, India, 2023, pp. 1314-1319, doi: 10.1109/ICAIS56108.2023.10073787.

[7]. A. CS, D. M, H. V. R and A. Anju, "Currency Recognition For The Visually Impaired People," 2022 IEEE Delhi Section Conference (DELCON), New Delhi, India, 2022, pp. 1-3, doi: 10.1109/DELCON54057.2022.9753373.

[8]. V. B, H. S, P. V H AND MOHANA, "CURRENCY AND FAKE CURRENCY DETECTION USING MACHINE LEARNING AND IMAGE PROCESSING – AN APPLICATION FOR BLIND PEOPLE USING ANDROID STUDIO," 2022 INTERNATIONAL CONFERENCE ON AUTOMATION, COMPUTING AND RENEWABLE SYSTEMS (ICACRS), PUDUKKOTTAI, INDIA, 2022, PP. 274-277, DOI: 10.1109/ICACRS55517.2022.10029296.

[9]. N. Patange, V. Dhutre, V. Wani and S. Oak, "Comprehensive Analysis of Indian Currency Recognition System and Location Tracking for Visually Impaired," 2021 International Conference on Intelligent Technologies (CONIT), Hubli, India, 2021, pp. 1-6, doi: 10.1109/CONIT51480.2021.9498430.

[10]. R. Swami, S. Khurana, S. Singh, S. Thakur and P. K. R. Sajjala, "Indian Currency Classification Using Deep Learning Techniques," 2022 12th International Conference on Cloud Computing, Data Science & Engineering (Confluence), Noida, India, 2022, pp. 567-572, doi: 10.1109/Confluence52989.2022.9734149.

[11]. S. Mittal and S. Mittal, "Indian Banknote Recognition using Convolutional Neural Network," 2018 3rd International Conference On Internet of Things: Smart Innovation and Usages (IoT-SIU), Bhimtal, India, 2018, pp. 1-6, doi: 10.1109/IoT-SIU.2018.8519888.

[12]. R. Swami, S. Khurana, S. Singh, S. Thakur and P. K. R. Sajjala, "Indian Currency Classification Using Deep Learning Techniques," 2022 12th International Conference on Cloud Computing, Data Science & Engineering (Confluence), Noida, India, 2022, pp. 567-572, doi: 10.1109/Confluence52989.2022.9734149.

