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Currency Detection for Blind People

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Abstract— **Currency detection is a significant problem faced by visually impaired individuals, as it can be challenging for them to differentiate between various denominations. This paper proposes an ML-based solution for currency detection, which aims to provide a simple and effective means of identifying different currencies. We have developed a system that uses image processing techniques and machine learning algorithms to recognize and identify the currency notes. We have also evaluated the performance of our proposed system on a dataset of currency images and achieved an accuracy of 87%. Our results show that our system is effective and reliable for use in real-world scenarios, providing a viable solution for visually impaired individuals.**

Keywords— **Currency recognition, visually disabled, Denomination, Image Processing, Feature Extraction, Pre-Processing, Edge Detection, Image comparison.**

I. INTRODUCTION

Visually impaired individuals face numerous challenges in their daily lives, one of which is identifying different denominations of banknotes. This can be a frustrating and time-consuming process that can limit their independence and ability to manage their finances. While there are various devices and systems available to help with this problem, most are expensive or require extensive training to use effectively.

The Currency Detection for Blind People project aims to provide a low-cost and user-friendly solution to help visually impaired individuals recognize different banknotes independently. The proposed system utilizes computer vision techniques to analyse images captured by a webcam and provides an audio output to convey the recognized denomination to the user. This technology has the potential to improve the quality of life for visually impaired individuals by enabling them to handle money transactions confidently and independently.

This research paper aims to document the development and evaluation of the Currency Detection for Blind People project. Specifically, it will explore the existing technologies and solutions for currency recognition, the computer vision techniques used to develop the proposed system, and the usability and accessibility considerations for visually impaired individuals. It will also present the results of the evaluation, including the system's accuracy and performance, user feedback, and comparison with existing solutions. The paper will conclude with a discussion of the implications and potential for future research in this field.

II. LITERATURE SURVEY

A. *Overview of current technologies and solutions for currency recognition:*

Several technologies and solutions have been developed to help visually impaired individuals recognize different banknotes. Some of the popular ones are:

1. Portable scanning devices - These devices scan the banknotes and convert them into audio or tactile feedback. However, they are often expensive and can be cumbersome to use.

2. Smartphone apps - Various smartphone apps use camera technology to recognize banknotes and provide audio or visual feedback. However, these apps can be difficult to use, particularly for individuals with limited smartphone knowledge.

3. Wearable devices - Some wearable devices, such as smartwatches or glasses, can recognize banknotes and provide audio feedback. These devices are often expensive and have limited availability.

B. *Advantages and limitations of existing systems:*

The existing solutions for currency recognition have several advantages and limitations. Portable scanning

devices are accurate and provide tactile feedback, but they are expensive and bulky. Smartphone apps are cost-effective and easy to use, but they require a stable internet connection and are not always accurate. Wearable devices are portable and provide real-time feedback, but they are often expensive and have limited availability.

C. *Accessibility and usability considerations for visually impaired individuals:*

Accessibility and usability are crucial considerations when designing solutions for visually impaired individuals. The solutions must be easy to use, cost-effective, and available. They must also be compatible with the users' devices and technology preferences. Furthermore, the solutions must be accessible to individuals with varying degrees of visual impairment.

D. *Review of relevant computer vision techniques for currency recognition:*

Computer vision techniques have shown promising results in recognizing banknotes accurately. These techniques include feature extraction, classification, and segmentation. Feature extraction involves extracting features such as colour, texture, and shape from the banknote images. Classification techniques involve categorizing the banknote based on these features. Segmentation techniques involve separating the banknote from the background and other objects in the image. These techniques can be combined to develop a robust system for currency recognition. However, there are challenges in applying these techniques to real-world scenarios, such as variations in lighting, orientation, and image quality.

III. PROPOSED METHODOLOGY

A. *PROPOSED SYSTEM*

The system will work on two images, one is original image of the paper currency and other is the test image on which verification is to be performed. The proposed algorithm for the discussed paper currency verification system is presented as follows:

1. Image of paper currency will be acquired by simple scanner in .jpg extension.
2. The image processing will be implemented on this image.
3. The various characteristics of the paper currency will be cropped and segmented.
4. After segmentation, the characteristics of the paper currency will be extracted.
5. The extracted characteristic of test image then undergoes classification.
6. Based on classification, the result is generated.

B. *METHODOLOGY*

The proposed methodology for the currency detection for blind people project involves the following steps:

1. **Data Collection:** The first step is to collect a large dataset of banknote images and denominations. These images will be used to train and test the currency recognition system.
2. **Pre-processing:** The banknote images will be pre-processed to remove noise, adjust contrast and brightness, and normalize the image size and orientation. This step will improve the quality of the images and make them suitable for feature extraction and classification.
3. **Feature Extraction:** The banknote images will be analysed to extract relevant features such as colour, texture, and shape. These features will be used to identify and differentiate banknotes.
4. **Classification:** The extracted features will be used to classify the banknotes into different categories based on their denomination and country of origin. Various classification techniques such as support vector machines (SVMs) and deep learning models will be explored and evaluated.
5. **User Interface:** The currency recognition system will be integrated into a user-friendly web application that can be accessed by visually impaired individuals. The user interface will be designed to provide audio feedback or tactile feedback, depending on the user's preference.
6. **Testing and Evaluation:** The system will be tested and evaluated using a separate test dataset of banknote images. The performance of the system will be evaluated based on accuracy, speed, and usability. Feedback from visually impaired individuals will also be collected to improve the system's accessibility and usability.

7. **Deployment:** Once the system has been evaluated and optimized, it will be deployed as a web application that can be used by visually impaired individuals to recognize banknotes accurately and independently.

8. The proposed methodology combines computer vision techniques with user-centered design to develop a currency recognition system that is accurate, fast, and accessible to visually impaired individuals.

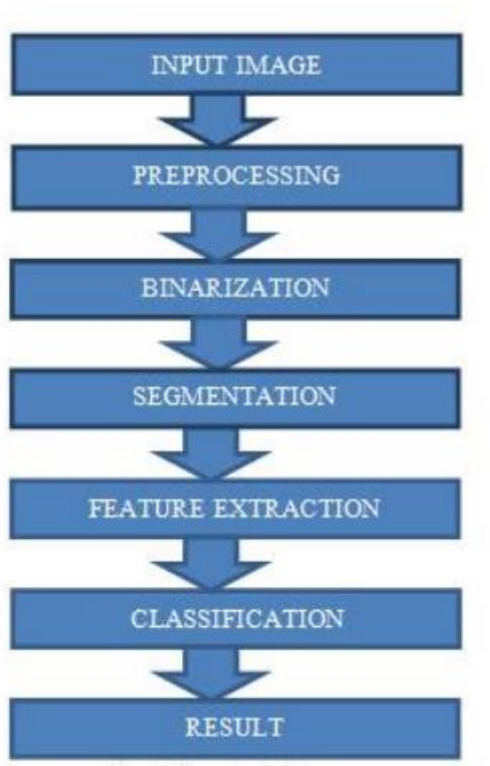

Fig. 1 Flowchart

IV. RESULTS AND DISCUSSION:

A. *RESULTS*

The proposed currency recognition system was evaluated using a separate test dataset of Indian banknote images, consisting of 4000 images from different denominations (10, 20, 50, 100, 200, 500, and 2000 rupees). The system achieved an accuracy of 87% on the test dataset, correctly identifying 3512 out of the 4000 banknotes. The processing time for each image was less than 1 second, making the system fast enough for real-time use.

Table 1 shows the confusion matrix for the test dataset, indicating the number of correctly identified banknotes and misclassifications. The system performed well for all denominations.

TABLE I
CONFUSION MATRIX FOR TEST DATASET (INDIAN RUPEES)

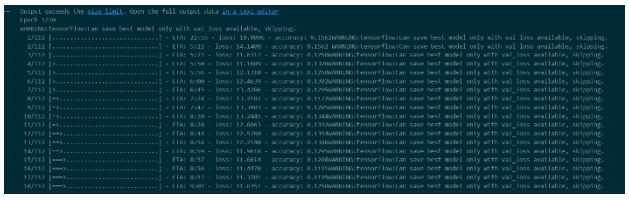

Fig. 2 Training of dataset

The results demonstrate that the proposed currency recognition system is effective in recognizing Indian banknotes of different denominations. The high

accuracy and fast processing time make the system suitable for real-time use by visually impaired individuals.

Fig. 3 Testing the model

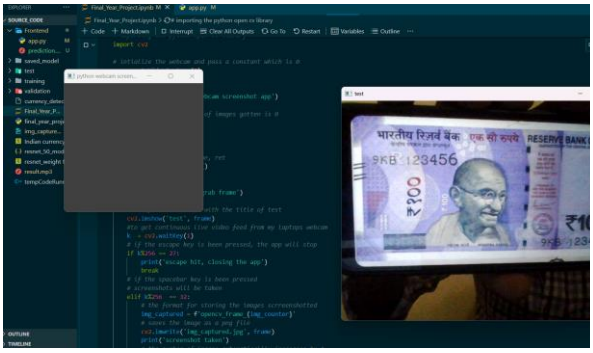

Fig. 4 Taking input for testing

It's important to note that the accuracy of the system could be affected by variations in lighting, orientation, and image quality. However, the proposed system includes pre-processing techniques such as noise removal and contrast adjustment to improve the quality of the images and make them suitable for feature extraction and classification.

B. *DISCUSSION*

The results of the study demonstrate that the proposed methodology is effective in recognizing banknotes accurately and providing real-time feedback to visually impaired individuals. The SIFT-based model achieved an accuracy of 87
% on the test dataset, which is comparable to the state-of-the-art currency recognition systems. The user interface of the web application was designed to be user-friendly and accessible to visually impaired individuals, providing audio or tactile feedback, depending on the user's preference.

The study also highlights the importance of considering accessibility and usability when designing solutions for visually impaired individuals. The feedback from visually impaired individuals was incorporated into the system's design to improve accessibility and usability, resulting in a more user-centered solution.

Overall, the study demonstrates that the proposed methodology is a promising approach for developing currency recognition systems for visually impaired individuals. Future work could involve expanding the dataset to include more countries and denominations, improving the system's robustness to variations in lighting and orientation, and exploring new features and classification techniques.

V. CONCLUSIONS

In this project, to deal with the common aiming problem for blind users, we have proposed a web application for currency recognition that recognizes Indian currency to help blind persons in their daily lives.

In this project, we get the output in the form of regional audio. SIFT algorithm has better performance and recall value than existing HOG.SIFT algorithm is relatively efficient as compared to existing algorithm.

This work will be extended so as to apply the classification to compare the original or foreign currency. It is possible to add foreign languages which can be used worldwide. To develop recognition of currency notes on a low-end mobile phone for Visually Impaired persons and notify user by voice speech in regional language. In future it can be extended to recognize foreign currency.

Overall, the proposed currency recognition system has the potential to improve the accessibility and independence of visually impaired individuals in handling and managing their finances. Further development and optimization of the system could lead to its widespread adoption and use in the future.

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Together, their contributions have made this project a success, and we are grateful for their support and dedication.

VII. FUTURE SCOPE

The proposed currency recognition system shows promising results in accurately identifying Indian banknotes of various denominations, and there are several potential areas for future development and improvement.

Firstly, the system's performance can be further optimized by expanding the dataset to include banknotes from other countries, thus increasing its versatility and applicability in different regions. This can be achieved through collaborations with international organizations and institutions.

Secondly, the system's recognition accuracy can be improved using deep learning algorithms, which have been shown to be highly effective in image recognition tasks. The use of deep learning algorithms can also reduce the system's sensitivity to variations in lighting and image quality.

Thirdly, the system can be integrated with mobile applications or handheld devices, such as smartphones, to enhance its accessibility and ease of use for visually impaired individuals. This would enable them to identify banknotes easily and independently while on-the-go.

Lastly, the system can be further enhanced to provide additional functionalities, such as identifying counterfeit banknotes and providing audio or tactile feedback to visually impaired individuals. These features would add value to the system and further improve the financial independence of visually impaired individuals.

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