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Currency Detector Android Application for Visually Impaired People

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Abstract: *Not everyone in this world can see the colors or even the light from his/her eyes. These people are known as visually impaired people. Visually disabled people are partially sighted or completely blind. These types of people face many problems in their day-to-day life, including transactions through money. Every category of currency is different from the others, and the difference can be noticed through the naked eye. For visually challenged people, it is hard for them to differentiate between the notes. Higher organizations or institutions like Banks have expensive hardware machines that can easily determine the difference between original and fake notes. The technology used in those machines is not handy or cost-efficient. So, to overcome this issue, this project can help the visually disabled person recognize the currency notes using a mobile camera.The system will be developed as an Android application and will use high-performance image processing techniques.*

Keywords: Currency identification, visually disabled, TensorFlow, Android application, Image processing techniques.

I. INTRODUCTION

Of the 295 million visually disabled people in the world,70million are from India (about 18 million are completely blind). A petition by an NGO called the All-India Federation of the Blind said that visually impaired people were affected and recognized the new Rs 50, Rs 200, Rs 500, and Rs 2,000 banknotes [2]. They showed that the new currency is different in size. The plea said that this trouble can lead to difficulty in the transaction for the visually impaired. Identifying each note correctly is a challenge for anyone with visual impairment. Because they are disabled, they are repeatedly scammed with fake currency. Therefore, the need for a simple system to help in detecting notes is important. In August 2019, RBI also realized this problem and came up with the idea of providing an Android application for the visually impaired [2]. The concept of this Android application is that it will work on voice command, firstly the user will open the application through voice command and then the user will simply take out the note and place it behind the camera, within 2-3 seconds, a voice will be heard telling which note the user had held. Hence, our motivation is to help visually disabled people in India. This application will be easy to use and hence require less computation power.

Here are some of the goals of this project: -

- The main aim of the project is to help the visually impaired determine the currency.
- Another goal is to get precise results in different lighting conditions and follow the Android
- app using voice commands with a simple Graphical User Interface (GUI).
- Since the system will work entirely on commands, it is easy to use, practical, and economical for the visually impaired.

Many problems arise when we use this method to target blind people. The user does not know conditions such as lighting, contrast, saturation, or even whether the note is visible in the camera. The system requires changes to many of the images that will be taken by the user. Using the app should be easy for visually impaired people. It must have cameras that must be activated by voice command, and it must not have a single-user login. Therefore, the issue requires innovative ideas that can trust and validate invoices in various environments.

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II. LITERATURE SURVEY

Many researchers have made distinct contributions to the advancement of currency recognition techniques. owing to the variations in characteristics among coins Researchers take a unique approach to the recognition issue for each of the bills (notes). In this part, we will review earlier research on currency recognition methods.

The research by Pratiksha Ganjaveet al.[1] focuses on various image processing algorithms(SIFT-Scale-Invariant Feature Transform, FAST- Features from Accelerated Segment Test, ORB- Oriented FAST and Rotated BRIEF and SURF- Speeded Up Robust Features) for an image-processing-based currency detection system. In feature extraction and matching, these methods are applied. This particular study concentrates on Indian currency notes. The algorithms have been studied, and it has been discovered that each algorithm has benefits and drawbacks.

To address the issue of visually challenged persons being able to recognize notes, Srushti Samant et al.[2] created a system wherein cash recognition is achievable by employing several image processing techniques.

To assist blind people in their daily lives, Snehal Sarafet al.[8] proposed a mobile appfor currency recognition that can recognize Indian currency form solving blind people's difficult problems. Regional audio is the output format for this project. The SIFT algorithm outperforms the current HOG in terms of performance and recall. Compared to other algorithms, the SIFT algorithm is reasonably efficient.

Shweta Yadav et al.[3] developed a solution to help blind people in their daily life, solve problems faced by blind users, and created a smart cash app for Indian rupee detection.YoloV3 has a superior recall value and performance.

Venkata Sai Teja et al.[5] proposed a system that would allow a visually impaired person to know the accuracy of the results shown when using the proof. When my MATLAB method is run on a Raspberry Pi using a scanner or camera, it captures currency notes and processes the images as defined in the project, highlighting its ability to identify true and false HSV values of the currency, which in front gives the ability to a person with disabilities to detect it.

III. METHODOLOGY

Mostly the methods of currency recognition are hardware methods, so to make it more feasible for people, having a software system will be beneficial. A software solution includes a camera that can be activated by voice command and does not require user input once activated.

Some constraints for image identification are Fluorescence, Intaglio, Serial number, and Reserve Bank of India logo.

The following figure depicts the proposed system:

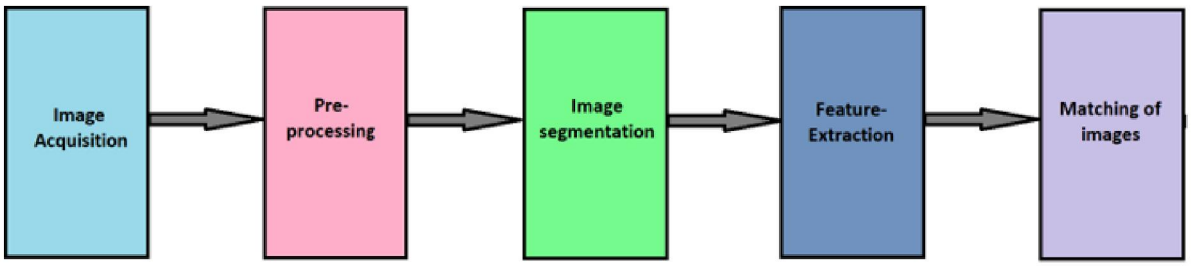

Figure 1.Conceptual Model Architecture Diagram

The process described in this document includes the following steps:

1) Image Acquisition
2) Preprocessing
3) Image segmentation
4) Feature Extraction
5) Matching of images

Image Acquisition:

It is a key step in the study as no action is taken before the image is taken. It involves storing images from a source (usually a hardware source).

Hardware sources include cameras and sensors. It is the most crucial step because an inaccurate image will render the entire workflow useless.

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Pre-processing:

It is used to increase accuracy, as well as reduce complexity. There are many image preprocessing methods, such as resizing the image, converting the image to grayscale, and enhancing the image. It ensures that the data is consistent. Preprocessing allows us to remove unwanted corruption and enhance certain features that are important to the application we are working on. Images need to be preprocessed in order for the software to work properly and produce the desired results.

Image Segmentation:

In this process, we divide the image into different groups, called segments, to do the main processing instead of the full image, to reduce the complexity of the image, and to facilitate further processing or analysis of the image. The purpose of segmentation is to simplify or transform the representation of the image into something more useful and interpretable.

Feature Extraction:

Features are special properties that describe the image. Extract features to distinguish images. Images are made up of pixels. So, in feature extraction, we find which parts of the image are special, such as lines, corners, and special patches, which can uniquely identify the image. Feature extraction helps reduce the amount of redundant information in a dataset. The ORB (Oriented FAST and Rotated BRIEF) algorithm is a good example of feature detection.

Parameters to be considered forcurrency detection are:

- Currency value area
- Reserve Bank of India logo
- Security Thread
- Serial number
- Mahatma Gandhi logo
- Satyamev Jayate logo

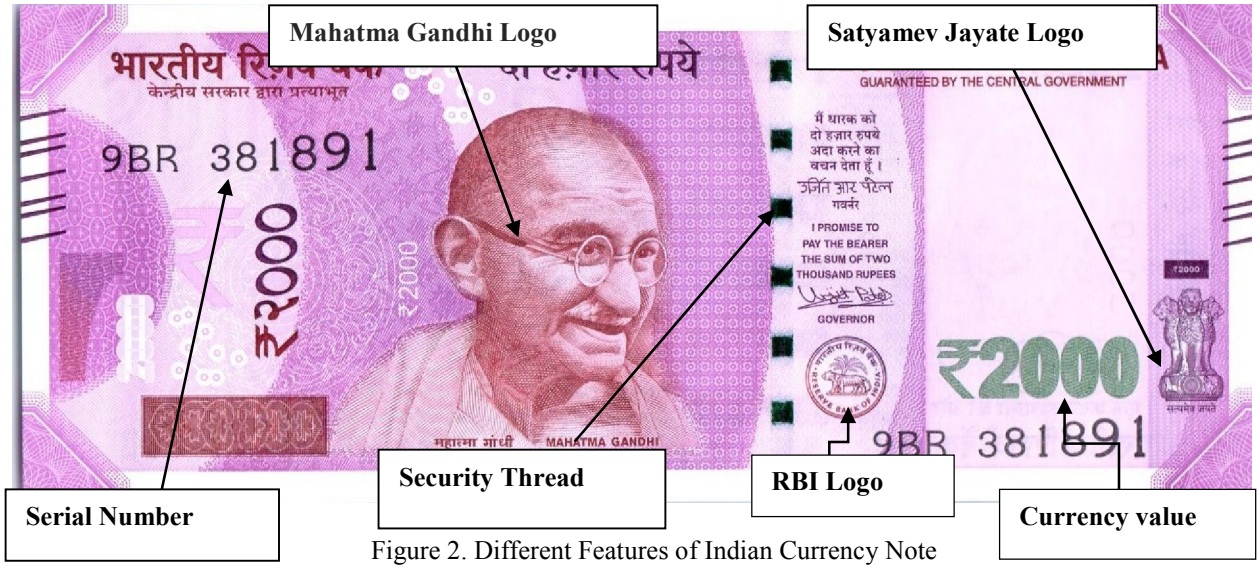

Figure 2. Different Features of Indian Currency Note

Matching of images:

During this matching, the best value that matches the data tells it to match the currency. It also provides audio informati on for visually impaired people.

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IV. PROPOSED SYSTEM

The methods that can be used to detect currency notes are generally non-public hardware systems. The novelty of the system is that it is cheap and easy to use for blind people in India. For the visually impaired, the app should be easy to use. It will have a camera that will be activated by voice command and will not require user input when activated. In short, the challenge requires new cost-effective, robust, and efficient models in many areas. Newer systems with better GUIs may well meet these needs. It is extremely easy to use, as the proofing result is shown in Figure 3, open the Android app, tap the screen to open the camera. After turning on the phone camera, the user can tap anywhere on the screen to take a photo. The application system will be developed to identify different banknotes of 10, 20, 50, 100, 200, 500, and 2000 rupees. The application will provide an audio output of the results. The system will only show satisfactory results that match the original results and show immediate and accurate results.

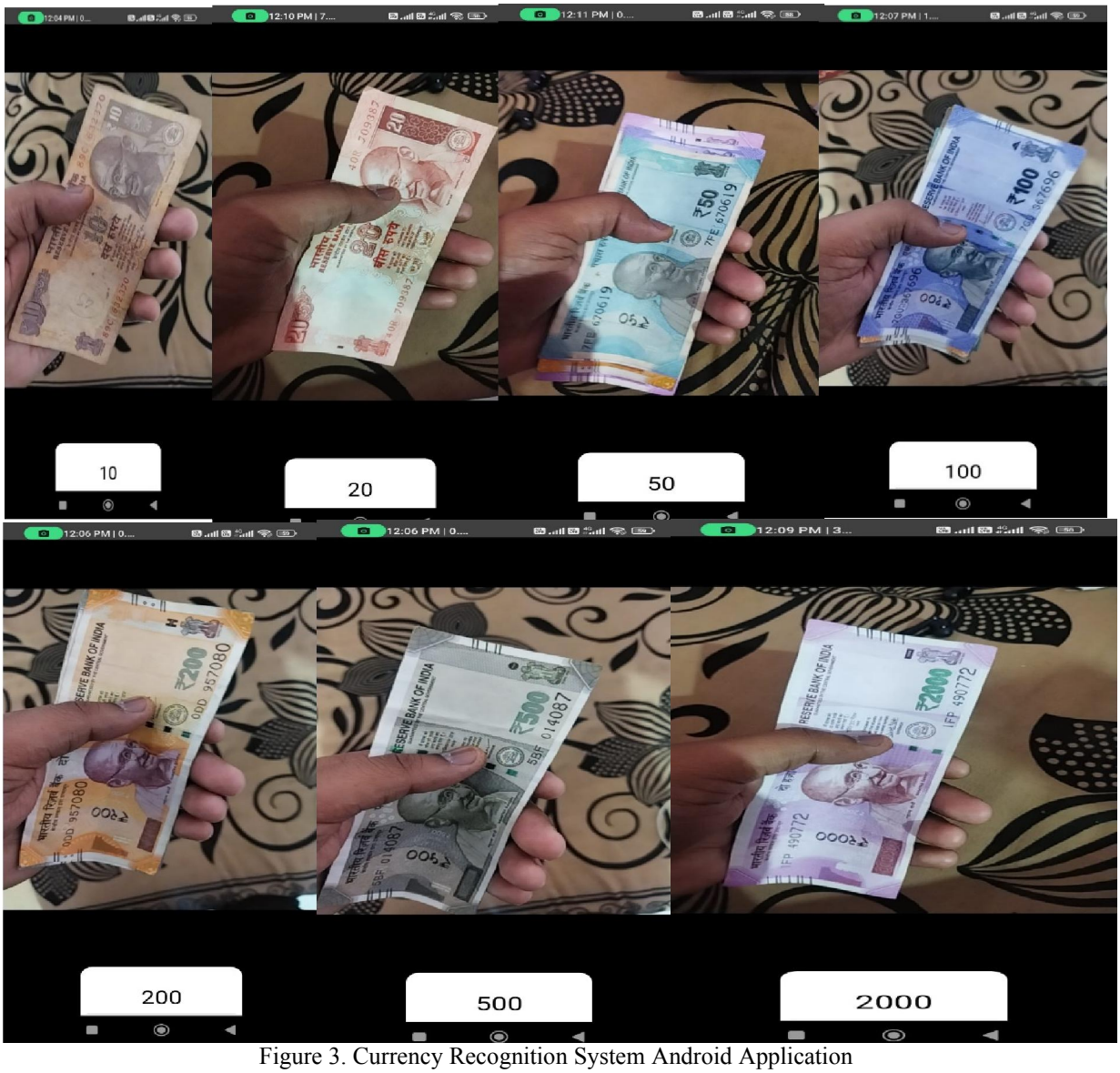

Figure 3. Currency Recognition System Android Application

4.1 System Flowchart

In the flowchart of the system, the first target user captures images. In this case, there are two major decisions that the system must make to work, the first is to check that the photos taken by the user are free of noise and that there are special features in the photo that describe the text. Otherwise, the user will receive an error message.

This flowchart is a physical tool that summarizes the activities to be performed in the currency recognition system.

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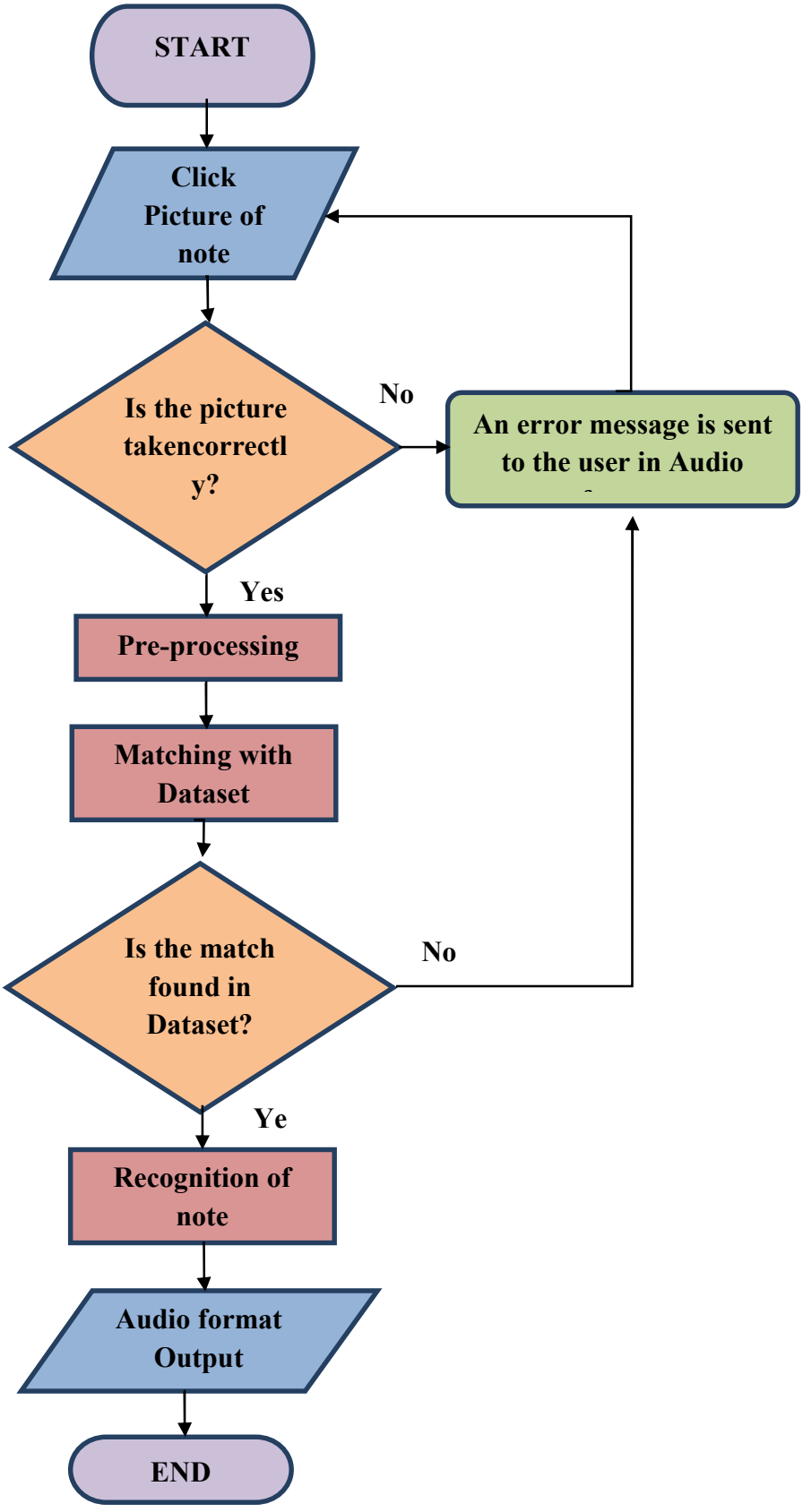

Figure 4. System Flowchart for currency recognition

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4.2 Algorithm

Working with TensorFlow:

TensorFlow is a powerful framework that works using a set of processing nodes, each representing a mathematical operation, and an entire family of nodes called "graphs". TensorFlow is a software library for computing on graphs, where: The nodes in the graph represent mathematical operations. The edges in the diagram represent multidimensional data (called tensors) communicating between them.

Algorithm Steps:

Step 1 - Collect the pictures.

Theneed to save more images, so it iseasier, and the system is more accurate. If the results are analyzed, several groups of 5, 10, 20, 50, 100, 200, 500, and 2000 are captured at different angles in different lighting to get more useful results. With these, the image detection dataset should be created, and this dataset should be fast.

Step 2 - Teach the model to learn from pictures.

After collecting enough pictures, the next step is to train the model. Docker containers can be used to install TensorFlow. This process takes a few minutes, depending on the number of images available and the number of training steps specified.

Step 3 - Optimizing Model.

This model is now available. To use the training model on a mobile device, it must be optimized using a tool called inference optimization, removing all unnecessary nodes and other optimizations.

Step 4 - Import the model into the Android app.

The optimized model will now be included in the app. Once the Android app is ready, it can be effectively used to identify Indian currency notes.

Step 5 - Test the training model in the created application.

Install the Build pack (APK) on the user's phone. See how it works on paper currency in different situations. This step is necessary as it helps measure usability. If problems are found with these steps, they should be improved by reviewing or adding information.

Accuracy Graph:

The graph shows the accuracy of the system in different light conditions and pictures taken from varying distances.

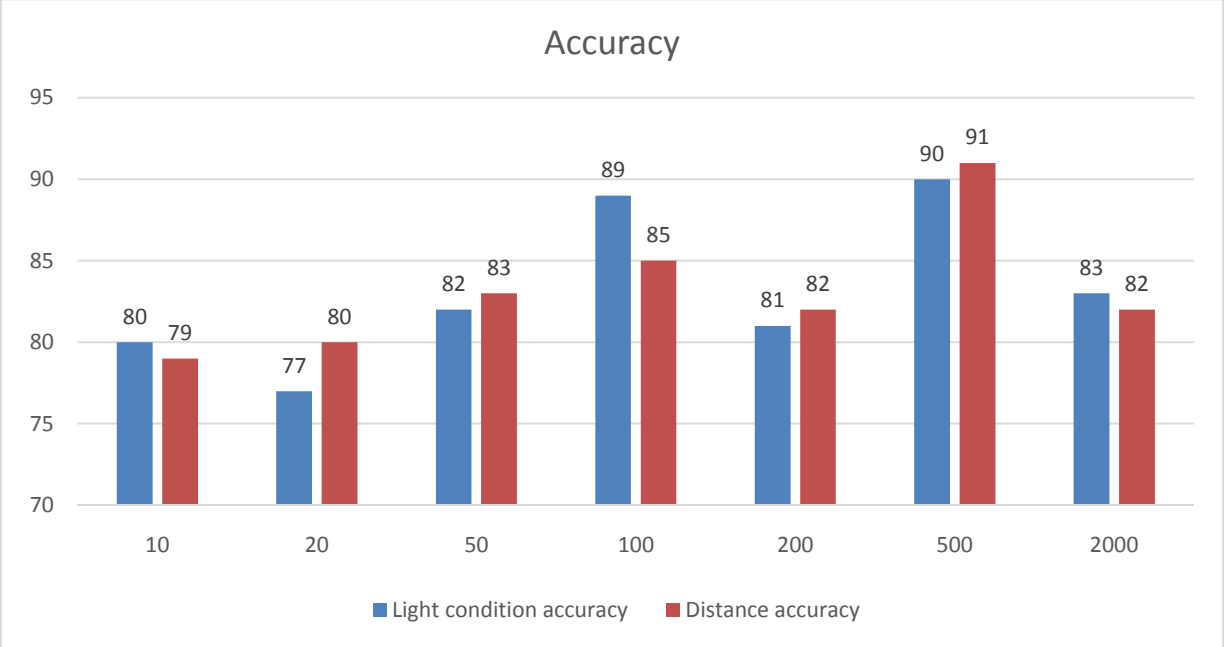

Chart 1.Showing the accuracy of the Android application in different light conditions and varying distances

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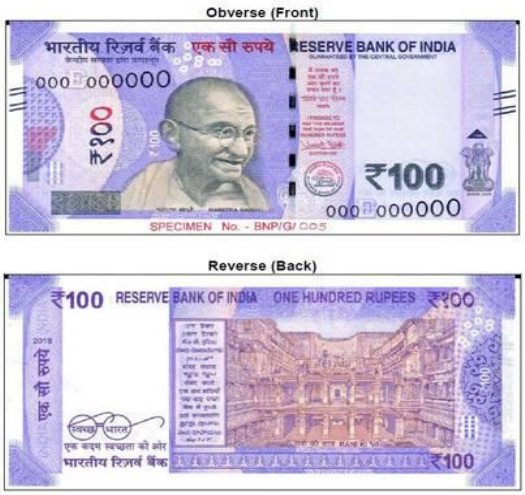
V. EXPERIMENTAL RESULT

Build an Android-based system to check the currency notes. Image processing and matching using the TensorFlow framework. The system has been tested on Android 10.0 and above.

To create the dataset, eight images were taken for each currency: four for the front and four for the back. Here, we take the image from the mobile phone as the input image, as in Figure 5.

We have stored many image files in our dataset. Recognize images from stored data using TensorFlow algorithms. Sound will be produced after matching.

Picture taken by user.



Picture from Dataset

Figure 5: Image taken by user's mobile phone and image matching from the dataset.

5.1 Performance Evaluation

We tested our system in various dataset sizes for performance evaluation. The time required for processing is captured for dataset preprocessing and currency matching.

Dataset Size	Time Required for Dataset Preprocessing (in seconds)	Time required for matching (in seconds)
20	0.61	3.02
40	1.13	5.27
60	1.72	7.02
80	2.10	9.21

Table 1. Time required for dataset preprocessing and currency matching.

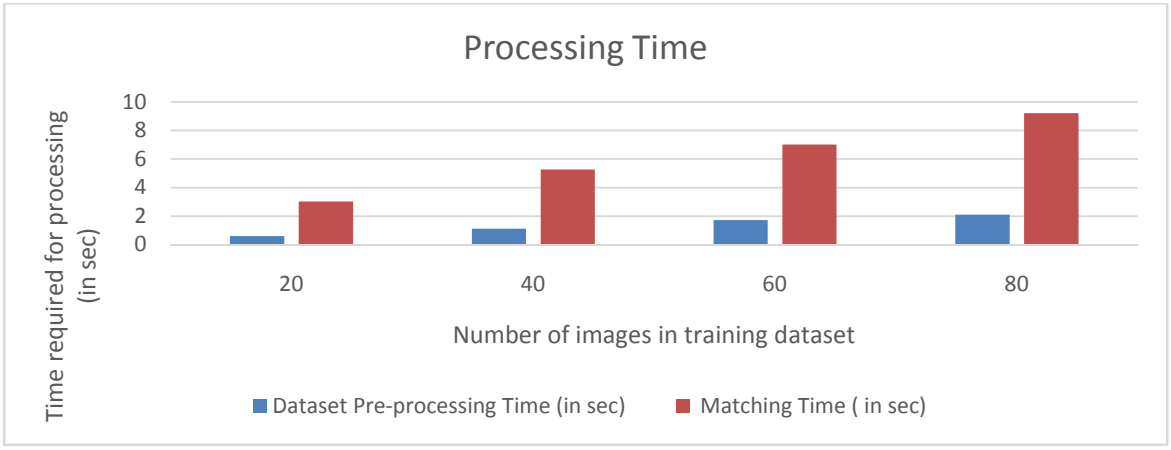


Chart 2. Graphical Representation of processing time.

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VI. CONCLUSION

The proposed system considers a solution that makes it possible to recognize currency by using various image processing methods to address the issue of visually impaired persons being able to recognize notes. The entire process applies to notes worth 10, 20, 50, 100, 500, and 2000. The technique is incredibly simple to use. It is highly adaptable to use this method in the actual world. The technology recognizes the monetary denomination and outputs the outcome as auditory data.

VII. FUTURE WORK

- Foreign currency recognition can be added in the future.
- The audio output can also be generated in regional languages.
- Accuracy of the project can be maximized.

REFERENCES

[1]. Pratiksha Ganjave1, Rushikesh Markad2, Gaurav Rasal3, Yash Kalekar4 "Currency Detector for Visually Impaired (Study of The System Which Identifies Indian Currency for Blind People)" International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 IJERTV10IS110073 (This work is licensed under a Creative Commons Attribution 4.0 International License.) Vol. 10 Issue 11, November-2021.

[2]. Srushti Samant1, Sakshi Sonawane2, Rohini Thorat3, Parsika Shah Bera4, Dr. N. P. Kulkarni5 "CURRENCY RECOGNITION SYSTEM FOR VISUALLY IMPAIRED PEOPLE" international journal of advanced scientific research and engineering trend Volume 5 Issue 3 March 2020.

[3]. Shweta Yadav, Mr. Zulfikar Ali Ansari, Kaushiki Gautam Singh "CURRENCY DETECTION FOR VISUALLY IMPAIRED" 2020 JETIR May 2020, Volume 7, Issue 5.

[4]. Gerrit J. J. van den Burg, Christopher K. I. Williams - "An Evaluation of Change Point Detection Algorithms - May 2020".

[5]. Venkata Sai Teja. D1, *A Krishnamoorthy2, P Boominathan3 "INDIAN CURRENCY RECOGNITION AND SPEECH SYNTHESIS FOR THE VISUALLY IMPAIRED PERSONS" International Journal of Pure and Applied Mathematics Volume 119 No. 15 2018

[6]. Prof. Rajesh Babu, Ms. Monali Patil, Prof. Jayant Adhikari; Fake Currency Detection using Image Processing (2018).

[7]. Anil Kumar B, KRJ Srikanth; Design and Development of real-time paper Currency Recognition System of Demonetization new Indian notes by using Raspberry Pi for Visually Challenged (2018)

[8]. Snehal Saraf, VrushaliSindhikar, Ankita Sonawane,Shamali Thakare "Currency Recognition System for Visually Impaired" Vol-3 Issue-2 2017.

[9]. Vedasamhitha Abburu, Saumya Gupta, S. R. Rimitha, Manjunath Mulimani, Shashidhar G. Koolagudi; Currency Recognition System using Image Processing (2017).

[10]. Yi C, Tian Y, Arditi A. Portable camera-based assistive text, and product labelreading from hand-held objects for blind persons. IEEE/ASME Transaction on Mechatronics.