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CURRENCY DETECTOR FOR VISUALLY IMPAIRED

Submitted by:
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NAAC ACCREDITED

CURRENCY DETECTOR FOR VISUALLY IMPAIRED

A Project Report

Submitted By:

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*in partial fulfillment of the requirements for the award of
the degree in*

MASTER OF COMPUTER APPLICATIONS

At



DEPARTMENT OF COMPUTER APPLICATIONS

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DEPARTMENT OF COMPUTER APPLICATIONS



CERTIFICATE

This is to certify that the project work entitled “**CURRENCY DETECTOR FOR VISUALLY IMPAIRED**” is a Bona fide record of the work done by **Ms. Suhana Shaju**, Reg No **LMC21MCA2031**, student of Department of Computer Applications, Lourdes Matha College Of Science And Technology, Kuttichal, Thiruvananthapuram, affiliated to the APJ Abdul Kalam Technological University, Kerala from August 2022 to November 2022 in partial fulfillment of the requirements for the award of the Degree of Master of Computer Applications from APJ Abdul Kalam Technological University, Kerala.

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Prof. Bismi K Charleys
(Head of the Department)

DECLARATION

I undersigned here by declared that the project report “**Currency Detector for Visually Impaired**” submitted for partial fulfilment of the requirements for the award of degree of Master of Computer Applications of the APJ Abdul Kalam Technological University, Kerala. This submission represents my idea in my own words and, I have adequately and accurately cited and referenced the original sources. I also declare that I have adhered to ethics of academic honesty and integrity and have not misrepresented or fabricated any data or idea or fact of source in my submission. I understand that any violation of the above will be a cause for disciplinary action by the institute and/or the University.

Place: Trivandrum

Suhana Shaju

Date: __/__/2023

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ABSTRACT

Apart from the immediate use of Master cards and any form of electronic payment methods, money has been widely used for general exchange due to its usefulness. However, visually impaired people have difficulty in recognizing the currency note. And the objective of this research work is to identify the Indian banknotes using an android mobile application. According to a recent survey In India, nearly 40 million people are blind or visually impaired, including 1.6 million children. Owing to a number of factors, visually disabled people had trouble identifying and accepting various types of banknotes. This issue has prompted researchers to create an automated banknote recognition device that can be converted into a vision-based system. This research project aims to develop a mobile app based on the Convolutional Neural Network using pre-trained representations to permit visually impaired people to see Indian banknotes in real-time situations. The elementary methods used in our planned system include pre-image classification, segmentation, histogram equalization, region of interest (ROI), and finally template matching using MobileNetV1-224, Teachable Machine and TensorFlow.

CHAPTER 1

INTRODUCTION

1.1 GENERAL INTRODUCTION

Currency is the medium of exchange. Money related transactions are an important part of our day to day lives. Along with technology the banking sector is also getting modern and being explored. In spite of the widespread usage of ATMs, Credit-Debit Cards, and other digital modes of payment like as Google Pay, Paytm, and Phone Pay, money is still widely used for most daily transactions due to its convenience. Currency recognition or banknote recognition is a process of identifying the denominational value of a currency. It is a simple and straightforward task for the normal human beings, but if we consider the visually challenged people currency recognition is a challenging task. Visually handicapped people have a difficult time distinguishing between different cash denominations. Even though unique symbols are embossed on different currencies in India, the task is still too difficult and time-consuming for the blind. This brings a deep need for automatic currency recognition systems. So, our paper studies about the systems in order to help the visually challenged or impaired people; so that they can differentiate between various types of Indian currencies through implementation of image processing techniques. The study aims to investigate different techniques for recognizing Indian rupee banknotes. The proposed work extracts different and distinctive properties of Indian currency notes, few of them are the central number, RBI logo, color band, and special symbols or marks for visually impaired, and applies algorithms designed for the detection of each and every specific feature. From our work the visually impaired people will be capable of recognizing different types of Indian Currencies while their monetary transactions, so that they lead their life independently both socially and financially.

1.2 GOAL OF THE PROJECT

This project

- Help blind people to detect currency easily
- Prevent others from taking advantage of blind people's situation
- Help to lessen their dependence on others
- Help them to carry on with their life in an easier way
- Since it provides a voice clip of the currency details it will help the users to understand the details easily

CHAPTER 2

LITERATURE SURVEY

2.1 STUDY OF SIMILAR WORK

Currency recognition or bank-note recognition is a process of identifying the denominational value of a currency. It is a simple and straightforward task for the normal human beings, but if we consider the visually challenged people currency recognition is challenging task. Visually handicapped people have a difficult time distinguishing between different cash denominations. Even though unique symbols are embossed on different currencies in India, the task is still too difficult and time-consuming for the blind.

2.2 EXISTING SYSTEM

There are two trends in Money recognition research field; Scanner-based and Camera-based. Scanner-based systems assumes capturing the whole paper (like scanner). Such systems are suitable for the Machinery of money counters. While camera-based systems assume capturing the paper by a camera which may capture a part of the paper. Most related works in literature deal with the scanner-based type [2-5]. For visual impairment usage, it's supposed to enable users to capture any part of the paper by their smart phone and let the system recognize it and tell the currency value. In this work, camera-based Indian paper currency is trained to be recognized using very simple image processing utilities what makes the processing time is very short with acceptable accuracy. The proposed systems have the ability to treat papers captured partially and under different lighting conditions.

2.1.2 DRAWBACK OF EXISTING SYSTEMS

Many currency recognition systems have been proposed. The authors recognize and classify four different currencies using computer vision. The features differentiated based on texture, colour, 1000 shapes of four different currencies. They use Artificial Neural Network for classification. The average Accuracy rate was 93.84%. Iyad et al. developed a mobile currency recognition system using a dataset for Jordanian currency. They applied this method on a smartphone using the Jordanian dataset based on the scale-invariant feature transform (SIFT) algorithm. The system produced accuracy 71% for paper currency and 25% for coin currency. The author proposed a mobile paper currency detection system that applied to Saudi Arabian papers. Recognizing paper currencies method is based on some interesting features and correlations between two images. It uses Radial Basis Function

Network for classification. The system has an accuracy of recognition 95.37% for the Normal Non-Tilted Images, 91.65% for Noisy Non-Tilted Images, and 87.5% Tilted Images.

CHAPTER 3

OVERALL DESCRIPTION

3.1 PROPOSED SYSTEM

In this work, we propose a general framework for identifying paper banknotes. There are 5 main stages in the system, as presented

- Image acquisition
- Pre-processing.
- Segmentation
- Histogram equalization
- Region of Interest (ROI) Extraction
- Template Matching

3.2 FEATURES OF PROPOSED SYSTEM

- This system stores the details of the currency note for comparison
- The user will be getting audio solutions
- This can be access in offline mode to
- Easy accessibility

3.3 FUNCTIONS OF PROPOSED SYSTEM

In proposed system we have two phases: offline and online. The offline phase in which the dataset is constructed from a given collection of Indian currencies images. The online phase in which the proposed method is running to detect and recognize the unknown input currency image. The online phase has five steps, pre-processing techniques for removing noise sand preparing the image for next operations, segmentation, and ROI extraction processes in the second and third step for extracting the foreground currency from the background, applying ORB Algorithm in step four and finally matching the results with the dataset. In the last step, the input to the system is obtained from the camera of any Android device and the output is a voice that informs the user with the value of the currency. In the proposed work, we will develop a system to detect currency for Indian Notes. First, take the input of the given image and pre-processed the given image and convert the RGB image into the grey-scale image. After pre-processing, apply the Sobel algorithm for the extraction of the inner as well as the outer edges of the image. Clustering will be done using YOLO V3 algorithm. In which it

forms the clustering of feature one by one. After that recognized the input image as a 200, 500, or 2000 and compare the features of the image and classified it as 200, 500, and 2000 or not with the help of the YOLO V3 algorithm.

3.4 REQUIREMENT SPECIFICATION

System Analysis is the process of studying a procedure or business in order to identify its goals and purposes and create systems and procedures that will achieve them in an efficient way. System analysis relates closely to requirements analysis. Requirement specification simply means figuring out what to make before you make it. It determines what people need before you start developing a product for them. Requirement definition is the activity of translating the information gathered into a document that defines a set of requirements. These should accurately reflect what the customer wants. It is an abstract description of the services that the system should provide and the constraints under the system must operate.

The requirements of specification of the proposed system are as follows:

1. Simple and effective user interfaces
2. Capability to handle large amounts of data
3. Minimum time needed for various processing
4. User friendly
5. Cost effective

3.5 FEASIBILITY ANALYSIS

An initial investigation culminates in a proposal that determine whether an ultimate system is feasible. When a proposed system is made and approved it initiates a feasibility study. The purpose of the feasibility study is to identify various candidate systems and evaluates whether they are feasible by considering technical, economical and operational feasibility and to recommend to best candidate system. The feasibility of such a program is listed in a simulated environment. Once all features are working property in a simulated environment, we can implement in a real platform. During product engineering, we consider following types of feasibility:

3.5.1 TECHNICAL FEASIBILITY

Technical feasibility identifies whether the proposed system can be developed with the existing technologies and available hardware and software resources. As part of the technical feasibility of the system, the following points are to be emphasized. Technical feasibility is frequently the most difficult area to assess at the stage of the product engineering process. It is essential that the process of analysis and definition be conducted in parallel with an assessment of technical feasibility. The considerations that are normally associated with technical feasibility are development risk, resource availability and technology.

3.5.2 OPERATIONAL FEASIBILITY

Proposed projects are beneficial only if they can be turned into information systems that will meet the operating requirements of the organization. This test of feasibility asks if the system will work when it is developed and installed. This project satisfies all the operational conditions. The project is found to work well on installation, all types of users can operate the system without any difficulty. User interfaces are designed in such a way that even ordinary users without having much knowledge in computer technology can easily operate the system. The access time of data is considerably low and the operation is less time consuming.

3.5.3 ECONOMICAL FEASIBILITY

An evaluation of development cost weighted against the ultimate income or the benefit derived from the developed system or product. Economic feasibility of a system means that the cost incurred in developing and implementing a system should not be higher than the financial benefits obtained by the users. During the economic feasibility study the following points were investigated.

- The cost to conduct a full system investigation
- The cost of hardware and software for the application being developed.
- The benefits derived by the users in terms of time, effort, accuracy of information, better decision making. Etc. are quantified and compared.

3.5.4 BEHAVIORAL FEASIBILITY

Behavioral Feasibility evaluates and estimates the user attitude or behavior towards the development of new system. It helps in determining if the system requires special effort to educate, retrain, transfer, and changes in employee's job status on new ways of conducting business.

CHAPTER 4

OPERATING ENVIRONMENT

4.1 HARDWARE REQUIREMENT

Development

- Processor: Intel Core i5
- Hard disk: 80GB Minimum
- RAM: 16 GB
- Monitor: 13inch Monitor
- Keyboard: Standard 101/102 keyboard

Deployment

- Processor: Intel Core i5
- Hard disk: 80GB Minimum
- RAM: 8 GB
- Monitor: 13inch Monitor
- Keyboard: Standard 101/102 keyboard

4.2 SOFTWARE REQUIREMENT

Development

- Operating System: Windows 11
- Environment: Any Web browser
- Front End: Android JAVA
- Back End: TensorFlow lite

Deployment

- Operating System: Windows 7 or above
- Environment: Any web browser with internet connection

4.3 TOOLS AND PLATFORMS

4.3.1. XML

Extensible Markup Language (XML) is a markup language and file format for storing, transmitting, and reconstructing arbitrary data. It defines a set of rules for encoding documents in a format that is both human-readable and machine-readable. The World Wide Web Consortium's XML 1.0 Specification of 1998 and several other related specifications all of them free open standards define XML.

The design goals of XML emphasize simplicity, generality, and usability across the Internet. It is a textual data format with strong support via Unicode for different human languages. Although the design of XML focuses on documents, the language is widely used for the representation of arbitrary data structures such as those used in web services.

Several schema systems exist to aid in the definition of XML-based languages, while programmers have developed many application programming interfaces (APIs) to aid the processing of XML data.

4.3.2. TensorFlow lite

TensorFlow Lite is a set of tools that enables on-device machine learning by helping developers run their models on mobile, embedded, and edge devices.

Key features

- Optimized for on-device machine learning, by addressing 5 key constraints: latency (there's no round-trip to a server), privacy (no personal data leaves the device), connectivity (internet connectivity is not required), size (reduced model and binary size) and power consumption (efficient inference and a lack of network connections).
- Multiple platform support, covering Android and iOS devices, embedded Linux, and microcontrollers.
- Diverse language support, which includes Java, Swift, Objective-C, C++, and Python.

- High performance, with hardware acceleration and model optimization.
- End-to-end examples, for common machine learning tasks such as image classification, object detection, pose estimation, question answering, text classification, etc. on multiple platforms.

4.3.3. MobileNet v1

MobileNet is a type of convolutional neural network designed for mobile and embedded vision applications. They are based on a streamlined architecture that uses depth wise separable convolutions to build lightweight deep neural networks that can have low latency for mobile and embedded devices.

4.3.4. Teachable Machine

Teachable Machine is a web-based tool that allows people to easily train machine learning models without the need for coding or advanced technical knowledge. Developed by Google, it uses a visual interface that enables users to create models that can recognize objects in images, identify sounds, or even perform speech recognition.

With Teachable Machine, you can train a model by providing examples of different categories of data, such as images of different animals, and then test the model to see how accurately it can identify new examples. Once you have trained a model, you can export it to use in your own projects, such as building an app or website that can recognize specific objects or sounds.

CHAPTER 5

DESIGN

5.1 SYSTEM DESIGN

System Design involves translating system requirements and conceptual design into technical specifications and general flow of processing. After the system requirements have been identified, information has been gathered to verify the problem and after evaluating the existing system, a new system is proposed. System Design is the process of planning of new system or to replace or complement an existing system. It must be thoroughly understood about the old system and determine how computers can be used to make its operations more effective.

System design sits at technical the kernel of system development. Once system requirements have been analysed and specified system design is the first of the technical activities-design, code generation and test- that required build and verifying the software. System design is the most creative and challenging phases of the system life cycle. The term design describes the final system and the process by which it is to be developed. System design is the high-level strategy for solving the problem and building a solution. System design includes decisions about the organization of the system into subsystems, the allocation of subsystems to hardware and software components and major conceptual and policy decision that forms the framework for detailed design.

There are two levels of system design:

- Logical design.
- Physical design.

In the logical design, the designer produces a specification of the major features of the system which meets the objectives. The delivered product of logical design includes current requirements of the following system components:

- Input design.
- Output design.
- Database design.

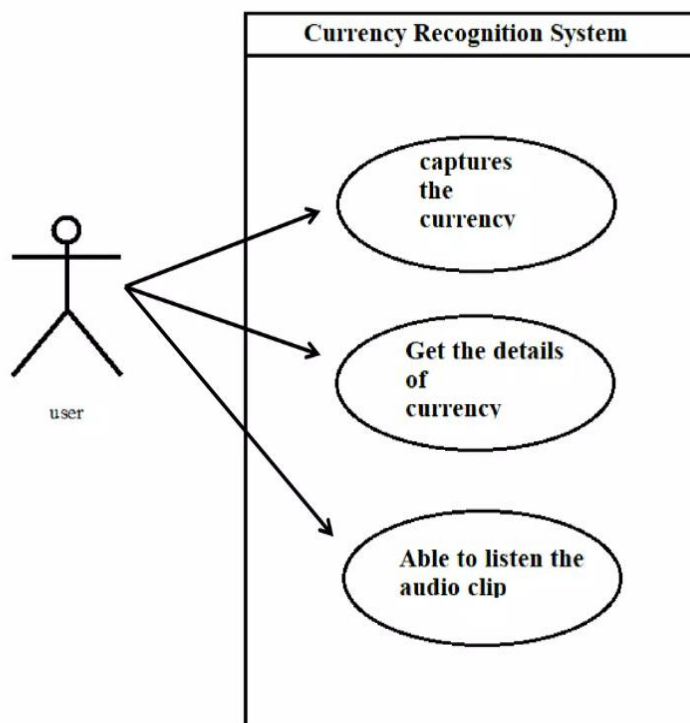
Physical design takes this logical design blue print and produces the program software, files and a working system. Design specifications instruct programmers about what the system should do. The programmers in turn write the programs that accept input from users, process data, produce reports, and store data in files. Structured design is a data flow-based methodology that partitions a program into a hierarchy of modules organized top-down manner with details at the bottom. Data flow diagrams are the central tool and the basis from which

other components are developed. The transformation of data from input to output, through processes may be described independently of the physical components.

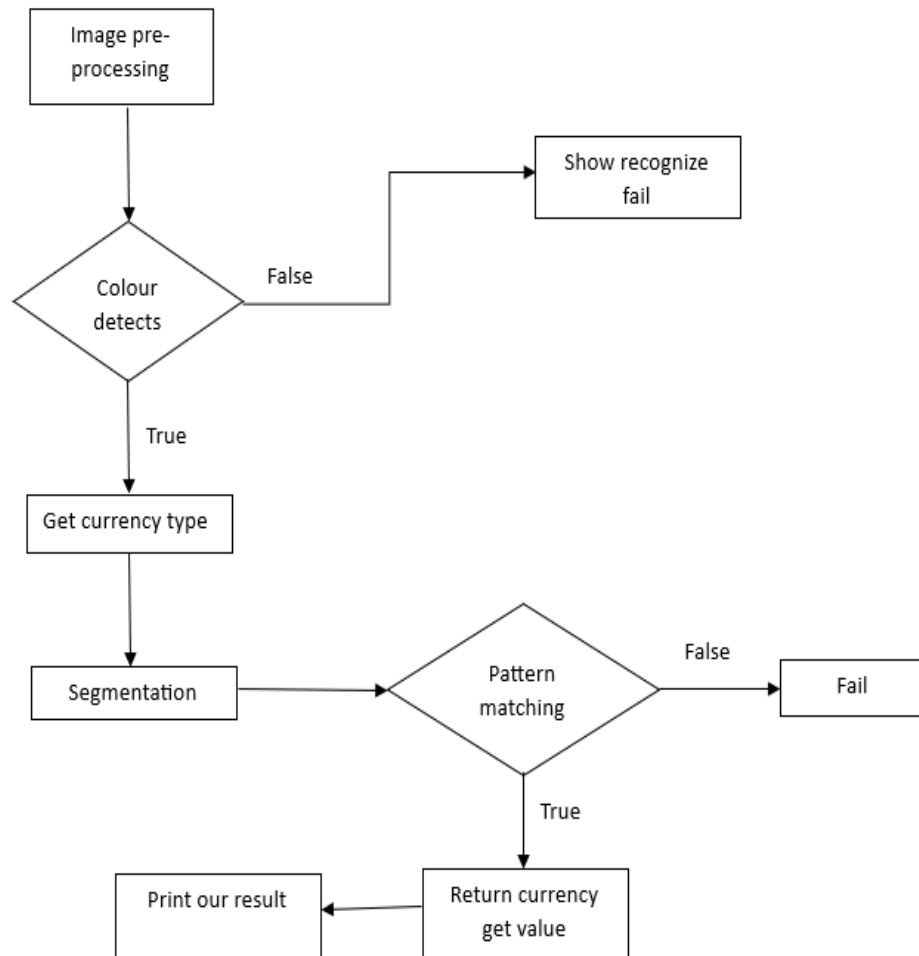
5.2 UML USE CASE DIAGRAM

The notation for a use case diagram is pretty straightforward and doesn't involve as many types of symbols as other UML diagrams.

- Use cases: Horizontally shaped ovals that represent the different uses that a user might have.
- Actors: Stick figures that represent the people actually employing the use cases.
- Associations: A line between actors and use cases. In complex diagrams, it is important to know which actors are associated with which use cases.
- System boundary boxes: A box that sets a system scope to use cases. All use cases outside the box would be considered outside the scope of that system. For example, Psycho Killer is outside the scope of occupations in the chainsaw example found below.
- Packages: A UML shape that allows you to put different elements into groups. Just as with component diagrams, these groupings are represented as file folders.



5.3 SYSTEM FLOW



5.4 INPUT DESIGN

The input design is the process of converting the user-oriented inputs into the computer-based format. The goal of designing input data is to make automation as easy and free from errors as possible. The input design requirements such as user friendliness, consistent format and interactive dialogue for giving the right message and help for the user at right time are also considered for the development of the project.

The following points should be considered while designing the input:

- What data to input?
- What medium to use?
- How the data should be arranged or coded?
- The dialogue to guide users in providing input.

- Data items and transactions needing validation to detect errors.
- Methods for performing input validation and steps to follow when errors occur.

Inaccurate input data is the most common cause of error in processing data. Errors entered by the data entry operators can be controlled by the input design. The arrangement of messages as well as placement of data, headings and titles on display screens or source document is also a part of input design. The design of input also includes specifying the means by which end user and system operators direct the system what action to take. The input design is the link between the information system and the user. It comprises the developing specification and procedures for data preparation and those steps that are necessary to put transaction data into a usable form for processing data entry.

The user interface design is very important for any application. The interface design defines how the software communicates within itself, to system that interpreted with it and with human who use it. The interface design is very good; the user will fall into an interactive software application.

Input design is the process of converting user-oriented inputs to a computer-based format. The data is fed into the system using simple interactive forms. The forms have been supplied with messages so that user can enter data without facing any difficulty. The data is validated wherever it requires in the project. This ensures that only the correct data have been incorporated into the system. Inaccurate processing of data is the most common cause of errors in data processing. Errors entered by data entry operators can be controlled by correct input design. This type of input design allows user to input only the required data into the processing units and also these input from check for validation of the input values, thus preventing errors.

The input design is made into user-friendly atmosphere where the user can perform the daily routine work without any one help. The user-friendly environment created by the input design helps the end user to use the software in a more flexible way and even the wrong entries by the user is correctly pointed out to the user.

The goal of designing input data is to make the automation easy and free from errors as possible. For providing a good input design for the application, easy data input and selection features are adopted.

5.5 OUTPUT DESIGN

Output generally refers to the results and information that are generated by the system. When designing output, system analyst must accomplish the following:

- Determine what information to present.
- Decide whether to display, print the information and select the output medium.
- Arrange the presentation of information in an acceptable format.
- Decide how to distribute the output to intended recipients.

A quality output is one, which meets the requirements of the end user and presents the information clearly. In any systems, results of processing are communicated to the user and to other systems through outputs. In the output design, it is determined how the information is to be displayed for immediate need.

The major idea of output is to convey information so its layout and design need careful consideration. Efficient, intelligible output design improves the system relationship with the users and help in making decisions. The output designs decide how well the implementation of the system has been useful to the user. The output design should be understandable to the user and it must offer great convenience. The one who look into the reports or output will get the impression of how well the system performs.

The objective of the output design is to convey the information of all the past activities, current status and emphasize important events. The output generally refers to the results and information that is generated from the system. Outputs from the computers are required primarily to communicate the result of processing to the users. They are also used to provide a permanent copy of these results for later consideration.

5.6 PROGRAM DESIGN

This program design consists of seven steps/modules that work together to achieve image style transfer:

Step 1 : Data Collection Module

Gather a diverse dataset of images containing different denominations of currency notes. Include variations in lighting conditions, angles, and backgrounds to improve the model's robustness.

Step 2 : Pre-processing Module

Pre-process the collected images to enhance their quality and normalize the data. This may involve resizing, cropping, and adjusting the brightness and contrast of the images.

Step 3 : Feature Extraction Module

Extract relevant features from the preprocessed images. This can be done using traditional computer vision techniques such as edge detection, contour analysis, or texture analysis. Alternatively, deep learning methods can be used to automatically learn discriminative features from the images.

Step 4 : Model Training Module

Choose a machine learning algorithm or a deep learning architecture to train the currency detection model.

Step 5 : Model Evaluation Module

Split the dataset into training and testing sets to evaluate the performance of the trained model. Use evaluation metrics such as accuracy, precision, recall, and F1 score to assess the model's effectiveness.

Step 6 : Model Optimization Module

Fine-tune the model and experiment with different hyperparameters to improve its performance. This may involve adjusting learning rates, network architecture, or regularization techniques to achieve better accuracy and generalization.

Step 7 : Integration Module

Integrate the trained model into an application or system specifically designed for visually impaired users. The application can be developed for smartphones, tablets, or wearable devices, making it accessible and convenient for the visually impaired to use.

CHAPTER 6

FUNCTIONAL AND NON-FUNCTIONAL REQUIREMENTS

6.1 FUNCTIONAL REQUIREMENTS

The functional requirements represent the intended behaviour of the system. The proposed system consists of

Accurate detection: The currency detector must be able to accurately detect the denomination of the currency, such as Rs10, Rs100 and Rs500 bills, to ensure that the user is given the correct information about the currency they are handling.

Voice output: The device should be equipped with a voice output feature that announces the denomination of the currency aloud, so that the visually impaired user can easily understand and identify the currency they are handling.

Easy to use: The currency detector should be easy to use, with large buttons and clear instructions for the user to follow.

Portability: The device should be portable and easy to carry around, so that the visually impaired user can take it with them wherever they go.

Battery life: The device should have a long battery life, to ensure that it can be used for extended periods of time without needing to be recharged.

Durability: The device should be durable and able to withstand the wear and tear of everyday use, to ensure that it will last for a long time.

Currency recognition speed: The currency detector should be able to recognize and announce the denomination of the currency quickly, to avoid delays and provide the user with a seamless experience.

User feedback: The device should provide feedback to the user, such as through vibrations or sound, to indicate that the currency has been successfully detected and recognized

6.2 NON-FUNCTIONAL REQUIREMENTS

There should be minimal lag between taking of the image and the result. The image processing should be as efficient with maximum accuracy. The system should give valid result for positive as well as negative test cases.

Currency Detector for Visually Impaired

- Accuracy: Accuracy in functioning and the nature of user-friendly should be maintained by the system.
- Speed: The system must be capable of offering speed.
- Graphical User Interface: This proposed system is highly user friendly by generating GUI using Python Tkinter.

CHAPTER 7

TESTING

7.1 SYSTEM TESTING

System Testing is the stage of implementation, which is aimed at ensuring that the system works accurately and efficiently as expected before live operation commences. It certifies that the whole set of programs hang together. System testing requires a test plan that consists of several keys, activities and steps to run program, string, system and user acceptance testing. The implementation of newly designed package is important in adopting a successful new system.

Testing Objectives

- Testing is the process of correcting a program with intend of finding an error.
- A good test is one that has a high probability of finding a yet undiscovered error.
- A successful test is one that uncovers an undiscovered error.

There are different types of testing methods available:

7.2 UNIT TESTING

In this testing we test each module individually and integrate the overall system. Unit testing focuses verification efforts on the smaller unit of software design in the module. This is also known as ‘module’ testing. The modules of the system are tested separately. The testing is carried out during programming stage itself. In this testing step each module is found to work satisfactory as regard to the expected output from the module. There are some validation checks for verifying the data input given by the user. It is very easy to find error and debug the system.

7.3 INTEGRATION TESTING

Data can be lost across an interface; one module can have an adverse effect on the other sub functions when combined by May not produce the desired major functions. Integrated testing is the systematic testing for constructing the uncover errors within the interface. This testing was done with sample data. The need for integrated test is to find the overall system performance.

7.4 BLACK BOX TESTING

This testing attempts to find errors in the following areas or categories: Incorrect or missing functions, interface errors, errors in data structures, external database access, performance errors and initialization and termination errors.

7.5 VALIDATION TESTING

At the culmination of Black Box testing, software is completely assembled as a package, interface errors have been uncovered and corrected and final series of software tests, validation tests begin. Validation testing can be defined in many ways but a simple definition is that validation succeeds when the software functions in a manner that can be reasonably accepted by the customer.

After validation test has been conducted one of the two possible conditions exists.

- The function or performance characteristics confirm to specification and are accepted.
- A deviation from specification is uncovered and a deficiency list is created.

7.6 OUTPUT TESTING

After performing the validation testing, the next step is output testing of the proposed system since no system could be useful if it doesn't produce the required data in the specific format. The output displayed or generated by the system under consideration is tested by, asking the user about the format displayed. The output format on the screen is found to be correct as the format was designed in the system according to the user needs. Hence the output testing doesn't result in any correction of the system

7.7 USER ACCEPTANCE TESTING

User acceptance of the system is the key factor for the success of the system. The system under consideration is tested for user acceptance by constantly keeping in touch with prospective system at the time of developing and making change wherever required. This is done with regard to the following points:

- Output Screen design.

- Input Screen design.
- Menu driven system.

7.8 WHITE BOX TESTING

White box testing is a testing case design method that uses the control structure of the procedural design to derive the test cases. The entire independent path in a module is exercised at least once. All the logical decisions are exercised at least once. Executing all the loops at boundaries and within their operational bounds exercise internal data structure to ensure their validity.

In our project testing was conducted at every step. Initially each module was tested separately to check whether they gave the desired output for the given input. The forms used to enter data by user were validated and appropriate error messages were displayed if incorrect data was entered. Once the data was entered correctly, the processing was done and testing was done to check whether the correct output was obtained. Once the test cases were conducted successfully for each module, the modules were integrated together as a single system. After integration, the test cases were again applied to check whether the entire system as a whole produced the desired output. At times, the test cases failed and the shortcomings were noted down and appropriate corrections were done. Once the integration testing was performed correctly, output testing was done and it did not result in any change or correction in the system. Black box testing and white box testing was also conducted successfully. All the loops, decisions, relations were executed at least once before giving it to the users for testing. In black box testing, it was checked whether the data in the proper format was stored in the database or not. Also, it was checked whether the interfaces were working properly or not. On successful completion of these tests, the system was then given to undergo user acceptance testing where the users entered test data to check whether the correct output was obtained. The users were satisfied with the output and thus the testing phase was completed successfully.

7.9 TEST DATA AND RESULTS

The primary goal of software implementation is the production of source code that is easy to read and understand. Clarification of source code helps in easier debugging, testing and modification. Source code clarification is enhanced by structural coding techniques, by good

coding style, by appropriate supporting documents, by good internal comments and by the features provided in the modern programming language.

In our implementation phase, source code contains both global and formal variables. It contains predefined functions as well as the user defined functions. The result of the new system is compared with old system and supposes if the result is wrong the error must be debugged.

After the acceptance of the system by the user, the existing system should be replaced by this system. Any user handles this package very easily. It does not require any intensive training for the user. Procedures and functions involved in this system are very simple that anyone can understand and correspondingly act to the system with no difficulty.

7.10 TEST CASES

Test Case No	Test Case Name	Test Case Step	Expected Result	Status	Defects
1	Adding currency	Adding new currency notes	System data is details of currency notes	Pass	Nil
2	Scan the currency	The user scans the currency	To get to now the value of the currency notes	Pass	Nil
3	Manage currency	Manage currency details	Categories the currency	Pass	Nil
4	Image pre-processing	To check whether the	To recognise	Pass	Nil

Currency Detector for Visually Impaired

		image passes the correct output	the currency		
5	System recognising	To provide stranded output	To matching the currency if 10 Rs is shown then the output wants to be 10 itself	Pass	Nil
6	Sending output	It sent the output in the form of speech/audio	Provide audio in the form of output	Pass	Nil

CHAPTER 8

RESULTS AND DISCUSSION

8.1 RESULTS

The results of a currency detector for visually impaired individuals should be accurate and reliable. The device should be able to correctly identify the denomination of the currency and provide clear and consistent voice output to the user.

By providing accurate information about the currency, the device can help visually impaired individuals to confidently handle money and engage in transactions independently. This can lead to increased independence and improved quality of life for the user.

Additionally, the ease of use and portability of the device can make it a valuable tool for visually impaired individuals who frequently handle currency, such as when shopping or using public transportation.

Overall, the success of a currency detector for visually impaired individuals can be measured by its ability to accurately detect and identify currency, provide clear and consistent voice output, and improve the user's ability to engage in independent financial transactions

8.2 SCREENSHOTS



Image 1 : App icon



Image 2 : App interface

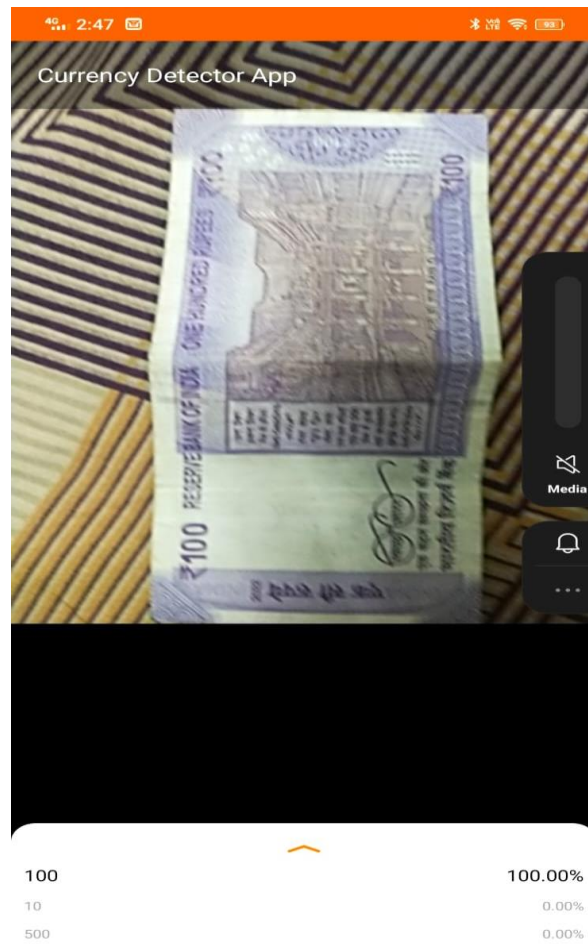


Image 3 : Detecting 100Rs Note

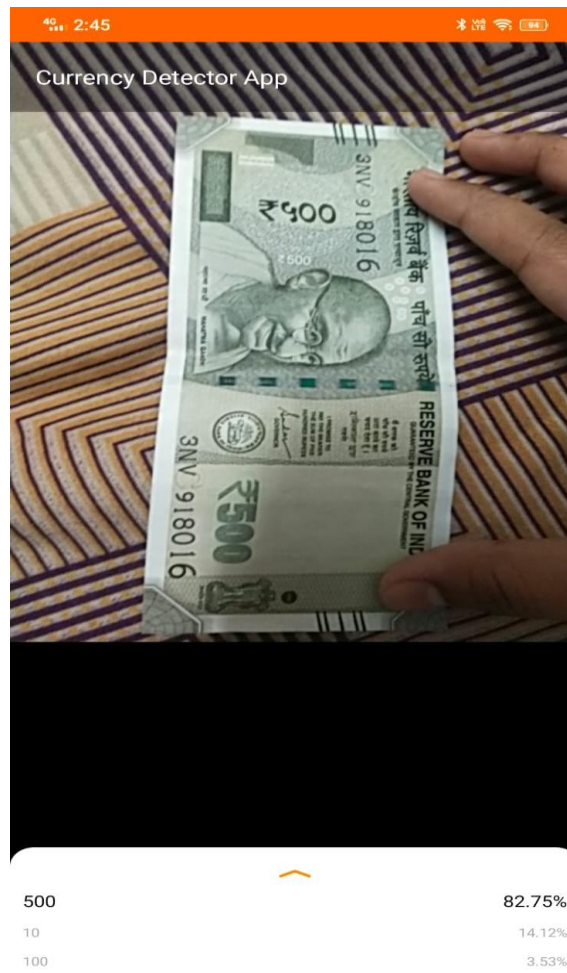


Image 4 : Detecting 500Rs Note

CHAPTER 9

CONCLUSION

9.1 SYSTEM IMPLEMENTATION

Implementation is an activity that is contained throughout the development phase. It is the process of bringing a developed system into operational use and turning it over to the user. The new system and its components are to be tested in a structured and planned manner. A successful system should be delivered and users should have the confidence that the system should have work efficiently and effectively. The more complex system being implemented, the more will be the system analysis and design effort required just for implementation.

Implementation is the stage of the system when the theoretical design is turned into working system. The plan contains an overview of the system, a brief description of the major tasks involved in the implementation, the overall resources needed to support the implementation effort, and any site implementation requirements. The plan is developed during the design phase and is updated during the Development phase. The outline shows the implementation plan.

There are three types of implementations:

- a. Implementation of a computer system for replacing the manual system. The problem encountered are converting files, training users, create accurate files.
- b. Implementation of new computer system to replacing an existing one. This is usually a difficult conversion. If not properly planned, there can be many problems. Some larger computer systems have taken as long as a year to convert.
- c. Implementation of modified application to replace an existing one using the same computer. This type of conversion relatively easy to handle, provided there are no major changes in file.

Implementation Plan Preparation

The implementation plan begins with preparing a plan for the implementation of the system. In this plan, discussion has been made regarding the equipment, resources and how to test the activities. The following information is acquired.

- What the task will accomplish?
- Resources required to accomplish the task.
- Key person(s) responsible for the task.

Examples of the major tasks are the following.

- Providing overall planning and coordination for the implementation.
- Providing appropriate training for the personnel.
- Ensuring that all the manual are applicable to the implementation.
- Providing all the technical requirements.
- Performing site surveys before implementation.
- Ensuring that all the prerequisites have been fulfilled before the implementation date.
- Providing personnel for the implementation team.
- Acquiring special software or hardware.
- Performing data conversion before loading data into the system.
- Preparing site facilities for implementation.

Implementation of Proposed System

After having user acceptance for the system developed, the implementation phase begins. Implementation is the stage of project during which theory is tuned into practice. During this phase, all the programs of the system are loaded into the user's computer. After loading the system training of the user starts. Such as type of training includes:

1. How to execute the package?
2. How to enter the data?
3. How to process the data (processing details)?
4. How to takeout the report?

The following two strategies are followed for running the system.

Parallel Run: In such run for a certain defined period, both the systems thereafter computerized and manual are executed in parallel. This strategy is helpful because of the following:

1. Manual result can be compared with the result of computerized system. For the care of demonstration of the success of this system, it was implemented with successfully running; manual systems and results are verified.
2. Failure of a computerized system at an early stage, do not affect the work of the organization, because the manual system continues to work as it used to do.

Pilot Run: In this type of run, some parts of the new system are installed first and executed successfully for the considerable time period. When the results are found satisfactory, only then the other parts are implemented. This strategy builds the confidence and errors are traced easily.

9.2 FUTURE ENHANCEMENT

- Enhancing the accuracy by building a model of features for each currency class.
- Working now on using local features instead of template matching.
- Enhancing the best frame to be processed for runtime application.
- Adding more currencies to the database.

9.3 CONCLUSION

In this paper, simple Indian currency recognition system has been proposed. The proposed system starts with capturing still image. Simple image processing techniques like thresholding, noise removal, histogram equalization and segmentation are used to extract the ROI and facilitate the template matching procedure. Correlation based template matching is used after that to find the ROI in the dataset images. The system has been written in MATLAB and Android platform as well. The MATLAB system considers offline captured images while the Android one was designed to match visual impaired users. Live video capturing is considered for the Android application. Automatic horizontal edges has proposed to match our template matching system.

CHAPTER 10

BIBLIOGRAPHY

10.1 BOOKS

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10.3 JOURNALS AND PUBLICATIONS

- **Currency Detector for Visually Impaired using Machine Learning Publisher: IEEE**

Published on: Bibhudyuti Nayak Dept. of Computer Science and Engineering, KCG College of Technology, Chennai, India ,Natraja Praveen Thota, Dept. of Computer Science and Engineering, KCG College of Technology, Chennai, India, Jadapalli Dinesh Kumar Dept. of Computer Science and Engineering, KCG College of Technology, Chennai, India, Dhanalakshmi R Dept. of Computer Science and Engineering, KCG College of Technology

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- <https://ieeexplore.ieee.org/document/4679917/>

APPENDICES

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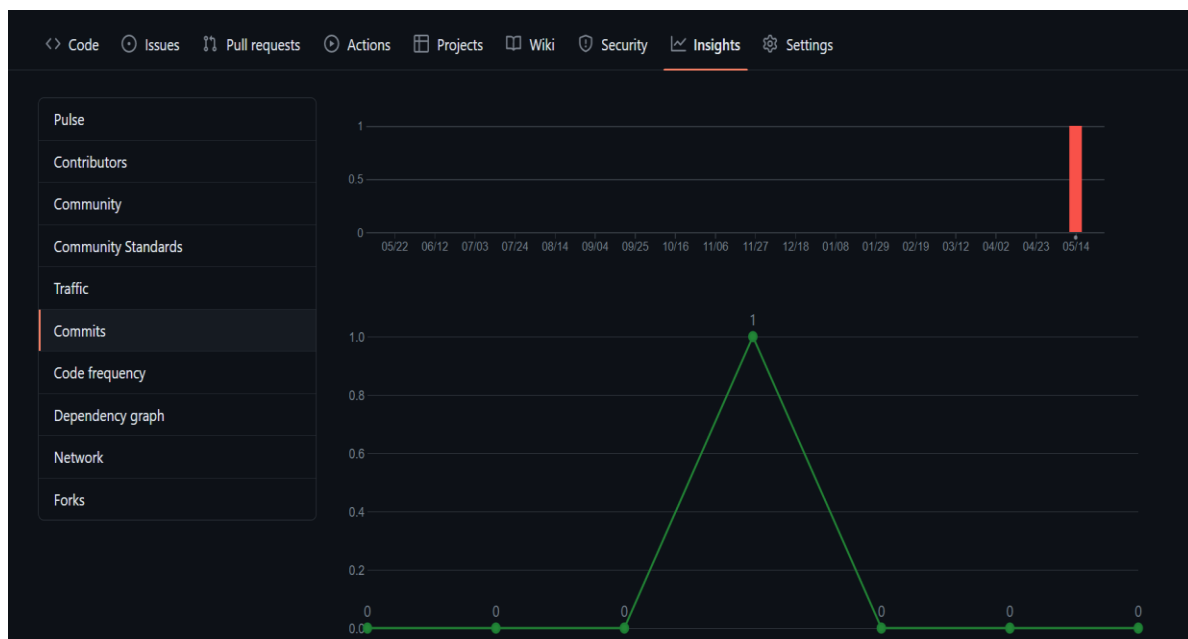
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Abbreviation and Notation

UML (Unified Modelling Language): Is a standardized visual language used in software engineering to represent and communicate the design of a system. UML diagrams are graphical representations that depict various aspects of a system, such as its structure, behaviour, and relationships between components. They provide a concise way to visualize and document system architecture, design patterns, and interactions among different elements.

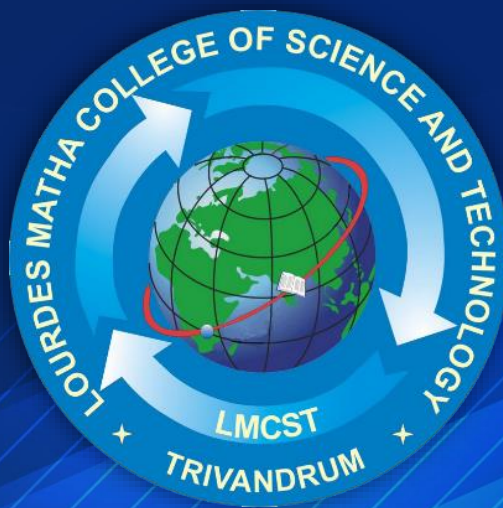
GIT HISTORY

The screenshot shows the GitHub repository page for 'SU-hana / currency-detector-for-visually-impaired'. The repository is public and has 0 stars, 1 watching, and 0 forks. The main branch is 'main'. The repository contains a file named 'PROJECT1/CurrencyDetectorAndroid...' with a commit history of 1 commit, 11 minutes ago. The repository description is 'No description, website, or topics provided.' There is a button to 'Add a README'.





MASTER OF COMPUTER APPLICATIONS (MCA)



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