

## IMAGE BASED CURRENCY RECOGNITION SYSTEM

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**Abstract :** *In this report, we propose a system for automated currency recognition using image processing techniques. The proposed method can be used for recognizing the country or origin as well as the denomination or value of a given banknote. Only paper currencies have been considered. This method works by first identifying the country of origin using certain predefined areas of interest, and then extracting the denomination value using characteristics such as size, color, or text on the note, depending on how much the notes within the same country differ. The following project mainly focuses on the recognition of currency by its image or photograph. It will help users to recognize details about currency like Currency Value, Currency Name, the value in INR, EURO and US Dollar. We have considered INDIAN Rupee and US Dollar, the most used currencies in our domain with their denominations. This system works accurately and also able to quickly identify the currency notes.*

**Keywords:** *currency recognition system, machine learning, image based retrieval.*

### I. INTRODUCTION

According to the UN charter there are around 195 countries around the globe. In which 193 countries are members of the UN and two are observing states. According to The U.N., worldwide there are 180 currencies. All these currencies are different in characteristics such as size, color and

texture. In the era of rapidly growing levels of trade between countries and also tourism all over the world, it becomes necessary to recognize each currency note correctly. Now a days people travel to different countries, they use their native country currency in paying bills or buying stuffs and because most of the local people are not familiar with the currency other than their own

country currency and also not familiar with the exchange rate of that currency in their own currency, it becomes necessary to develop an automated system that helps in recognition notes easily, faster with efficiency. The proposed system is based on image processing and makes the process robust and automatic. We used INR and USD as an example to illustrate the technique. This system is based on our knowledge about computer science technologies like Digital Image Processing, python and also a small step to implement in a system that is most important for industrial development. We used INR and USD as an example to illustrate the technique. This system is based on our knowledge about computer science technologies like Digital Image Processing, python and also a small step to implement in a system that is most important for industrial development. The block diagram as in Fig. 1 shows the used methods in the system to obtain the actual output same as the expected output. First of all input a currency note image, which needs to be checked. Then system performs basic image processing techniques on input image and refined to convert it into a usable input for matching with present image in dataset.

The system extracts the information from image based on features such as color and texture. With the help of these features the system determines currency name and denomination of the currency note. After this the exchange rate of currency will be extracted from internet with the help of online exchange rate api url. At the end output displayed on the screen.

The aim of this project is to develop an automated currency recognition system using image processing techniques to accurately identify the country of origin and denomination of a given banknote. The system will focus on recognizing paper currencies, specifically Indian Rupee and US Dollar, based on their images. The system should effectively identify the currency value, currency name, and provide the corresponding values in INR, EURO, and US Dollar.

## II. LITERATURE SURVEY

The 4th Edition, which celebrates the book's 40th anniversary, is based on an extensive survey of faculty, students, and independent readers in 150 institutions from 30 countries. Their feedback led to expanded or new coverage of topics such as deep learning and

deep neural networks, including convolutional neural nets, the scale-invariant feature transform (SIFT), maximally-stable extreme regions (MSERs), graph cuts, k-means clustering and super pixels, active contours (snakes and level sets), and exact histogram matching. Major improvements were made in reorganizing the material on image transforms into a more cohesive presentation, and in the discussion of spatial kernels and spatial filtering. Major revisions and additions were made to examples and homework exercises throughout the book. For the first time, we added MATLAB projects at the end of every chapter, and compiled support packages for students and faculty containing, solutions, image databases, and sample code.

Paper currency identification is an image processing technique i.e. worn to recognize currency of different countries. The paper currencies of different countries are possibly interweaved collectively consequently rises ever more. It is a challenge for standard currency recognition systems. However, the main focus of most of the standard currency recognition systems and machines is on recognizing forged currencies. Hence there is very vital role of currency identification

system and it is essential that the identification system should be very accurate. A thriving approach for paper currency identification depends upon preprocessing, feature extraction and classification of that currency image. In this paper, we have gone through different literature which describes different techniques of paper currency recognition. Finally we have concluded that if we apply some efficient pre-processing and feature extraction technique than we can improve the accuracy of identification system.

Money number recognition refers to the money of the currency, the currency and authenticity recognition. Money number recognition system is the kernel module of self-service system, and the major applied range is cash-related equipments. In this paper we design a kind of money number recognition system. The quick positioning of money number is achieved based on gray value accumulation. The edge line of money number area is detected using the least square method. Using geometrical rotation method and gray adjacent interpolation method to realize the number of tilt correction. Based on the character structure characteristic and the imaginary line and

character of the point of intersection features, formation recognition judgment tree, realized the character recognition. The simulation experiment indicates that this algorithm has high recognition accuracy under the condition of rejection.

The study of RMB (renminbi bank note, the paper currency used in China) serial number recognition draws more and more attention in recent years, for reducing financial crime, improving financial market stability and social security. The accuracy of RMB recognition relies heavily on the extraction, which is a challenging problem due to background variations and uneven illumination. In this paper, we present a new system that extracts the RMB characters directly from scanned RMB images. First, two different techniques, namely skew correction and orientation identification are used to detect the region which contains RMB serial number. Then the detected text region is binarized by a combined threshold technique. After that, a local contrast average method is introduced to extract the RMB characters from the binarization result. The experiments demonstrate that the proposed binarization method outperforms other well-known methods. For character

extraction, we report an overlap-recall rate of 79.68% and an overlap-precision rate of 98.10% respectively.

The author presents the book on digital image and analysis that has four sections and thirteen chapters, which is written at a junior-year or above level and used as a basis for advanced studies involving images. The first section deals with introduction and overview of digital image processes and analysis (Chapter 1), and computer imaging systems (Chapter 2). Section 2 contains digital image analysis and computer vision that includes chapters: 3 (introduction of digital image analysis); 4- image segmentation and line and edge analysis; 5- discrete transform (Fourier and other), and filtering; and 6- feature analysis and pattern classification. Section 3 covers digital image processing and human vision, and consists of chapters: 7- human vision and perception and heavily relates to the usefulness of image processing and the effects of noise reduction; 8- overview of image enhancement techniques; 9- image restoration; and 10- image compression with discussion of entropy and information. And section 4 deals with program and application development with CVIPtools (computer

vision and image processing (CVIP)), and has the following chapters: 11- basic use of the CD software; 12- application development; and 13- libraries.

Intelligent systems on Paper currency recognition and verification are inevitable for modern banking services. These systems are used in Auto-seller machines, vending machines etc. Extracting sufficient and reliable monetary characteristics are essential for accuracy and performance of such systems. This paper proposes a new intelligent system for paper currency recognition.

Pakistani paper currency has been considered, as a case study, for intelligent recognition. This paper identifies, introduces, and extracts robust features from Pakistani banknotes. After extracting these features, the paper proposes to use three layers feed-forward Backpropagation Neural Network (BPN) for intelligent classification. The proposed technique and system are simple and comparatively less time consuming which makes it suitable for real-time applications. In order to evaluate the performance of the proposed technique, experiments have been conducted on 175

Pakistani banknotes. The results indicate that system has 100% recognition ability on properly captured images.

Paper currency recognition (PCR) is an important area of pattern recognition. A system for the recognition of paper currency is one kind of intelligent system which is a very important need of the current automation systems in the modern world of today. It has various potential applications including electronic banking, currency monitoring systems, money exchange machines, etc. This paper proposes an automatic paper currency recognition system for paper currency. A method of recognizing paper currencies has been introduced. This is based on interesting features and correlation between images. It uses Radial Basis Function Network for classification. The method uses the case of Saudi Arabian paper currency as a model.

### III. PROPOSED SYSTEM

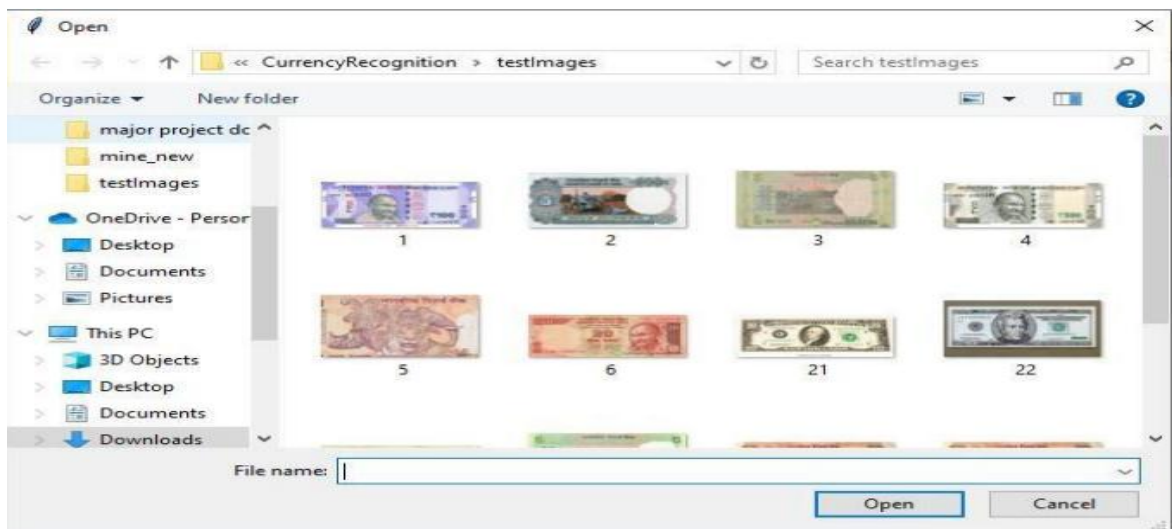
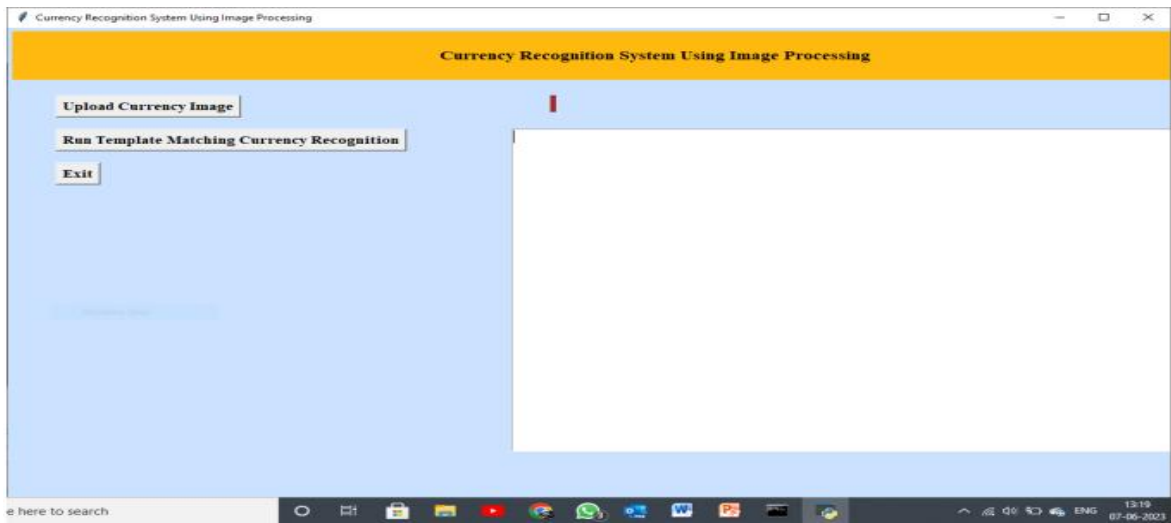
The proposed system is based on image processing and makes the process robust and automatic. We used INR and USD as an example to illustrate the technique. This system is based on our knowledge about computer science technologies like Digital

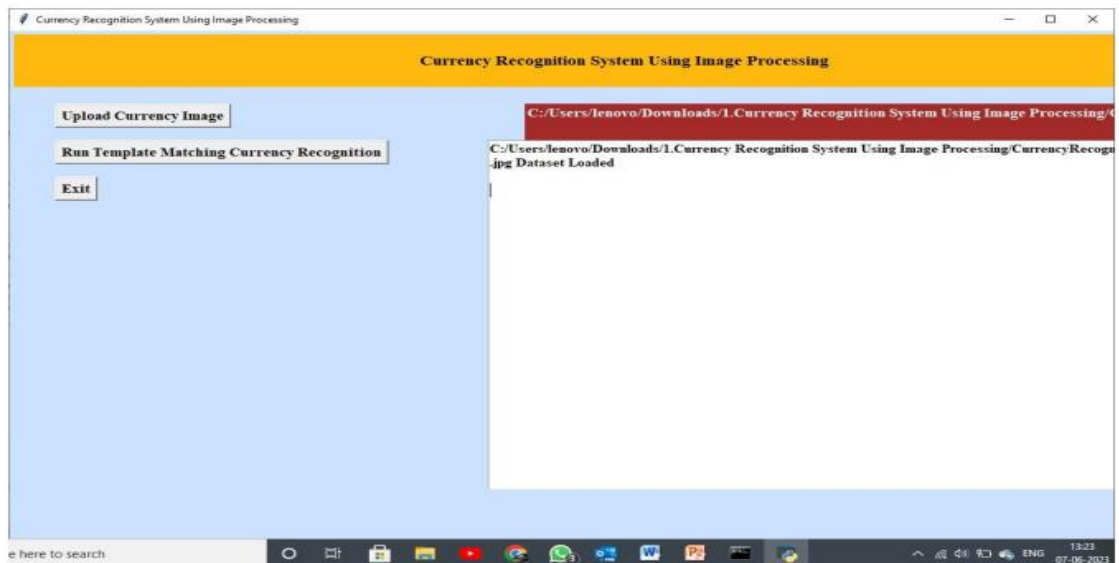
Image Processing, python and also a small step to implement in a system that is most important for industrial development. We had considered INDIAN Rupee and US Dollar for this project. Project can expand for more currencies inclusion according to use.

This paper introduced and adopted multispectral imaging analysis to conduct the corresponding research and the exploration for the purpose of effectively solving the problems of printing identification such as credentials, bills, legal documents and so on. In addition, it designed and had realized a method to identify printing that had laid a foundation for its more extensive application in printing identification field.

#### IV. RESULTS

The method is quite reasonable in terms of accuracy. The system deals with 110 images, 10 of which are tilted with an angle less than 15°. The rest of the currency images consist of mixed including noisy and normal images 50 each. It uses fourth series (1984–2007) of currency issued by Saudi Arabian Monetary Agency (SAMA) as a model currency under consideration. The system produces accuracy of recognition as 95.37%, 91.65%, and 87.5%, for the Normal Non-Tilted Images, Noisy NonTilted Images, and Tilted Images respectively. The overall Average Recognition Rate for the data of 110 images is computed as 91.51%. The proposed algorithm is fully automatic and requires no human intervention. The proposed technique produces quite satisfactory results in terms of recognition and efficiency.





## V. CONCLUSION

In conclusion, we have designed a system that accurately identifies both the country of origin and the denomination of a given banknote. Our system currently supports two of the most common currencies, but can easily be extended to more countries based

on the method we have previously described. When compared with the crude algorithm of pixel-by-pixel comparison, our algorithm is considerably more accurate, and takes less time. We have thus learned that our proposed algorithm is able to identify currency and denomination in an average of



5.3 seconds, which is a considerable improvement over the crude algorithm. However, our proposed system only considers a limited number of currencies. There are 180+ currencies that can be included in the system, and we have chosen to only do for 2 of the most common ones. Also, the system should be effective in identifying notes that are mutilated. Our system is not effective under this consideration. This can be worked on in the future.

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