International Journal of Innovative Technology and Exploring Engineering (IJITEE)
ISSN: 2278-3075 (Online), Volume-9 Issue-6, April 2020

Indian Counterfeit Currency Detection

Yepuri Spoorthi Hawanika, Kapavarapu Sai Sreeja, Yangala Shamitha, Bandaru Yuva Priyanka, Manam Srilatha

Abstract: ***The counterfeit currency printing rate has been increased with the progress of color printing Technology. Some people are printing fake currency using some laser printers. Therefore, the counterfeit currency notes production instead of the original currency notes has been rapidly increasing. This requires an efficient system that identifies the counterfeit currency note and displays the result. This paper developed a system consisting of image preprocessing, gray-scale conversion, image segmentation, edge detection, feature extraction, and comparison modules. The currency note is scanned and the scanned image is used in the modules. The outcome of the system will foretell if the note is counterfeit or genuine.***

Keywords: ***Counterfeit detection, Gray-Scale conversion, Image Processing, Image Preprocessing, Image Segmentation, Edge Detection, Feature Extraction.***

I. INTRODUCTION

In olden days, Goods and Services are exchanged all over the world through the barrier system of exchange. With the development of the currency system, Different Currencies are used in various places to exchange goods and services efficiently and most easily. With the advancement of technology paper currency notes originated. These notes gradually replaced the need for coin currencies which simplified high- level money transactions. Thereby, Paper currency notes usage increased rapidly. This led to the production of fake currency notes. Identifying fake currency notes in earlier days became harder as there is no system to detect and classify the notes as fake or real.

In recent times, Advancements in technologies like color printing, duplicating and scanning led to the evolution of fake currency notes causing serious problems like an increase in prices, Draining in the economy, etc. Hence the counterfeit currency detection system is necessary to control these problems. The Counterfeit currency detection system is incorporated in many places like banks counters, automated teller machines, shops, etc. where the money transactions of the country are done in large numbers.

Revised Manuscript Received on April 30, 2020.
***** Correspondence Author
Yepuri Spoorthi Hawanika*, Pursuing, Btech, Computer Science and Engineering at Velagapudi Ramakrishna Siddhartha Engineering College affiliated to JNTUK, Kakinada.
Kapavarapu Sai Sreeja, pursuing Computer Science program at VR SiddharthaEngineering College affiliated to JNTUK University, Kakinada
Yangala Shamitha, Pursuing B.Tech final year in Computer Science and Engineering at VR Siddhartha Engineering College affiliated to JNTUK University, Kakinada.
Bandaru Yuva Priyanka, Pursuing, B.Tech Computer Science and Engineering at VR Siddhartha Engineering College affiliated to JNTUK University, Kakinada
Manam Srilatha, Assistant professor, Computer Science and Engineering, VR Siddhartha Engineering College, Vijayawada

These systems make money transactions safe and secure within a limited time. These mobile systems are easy to maintain and help in detecting the authenticity of the currency. It is very hard to identify if the currency note is counterfeit or genuine with the help of the naked eye of the human as it may cause losses during money transactions. Hence Counterfeit currency detection systems are needed to identify if a currency note is fake or real with high accuracy within less amount of time. This system is designed such that any person can use it easily and be able to control it in a convenient manner. In recent times, Image processing has become a hugely developing area in the field of science, technology, and research providing various real - time applications to various aspects. Image processing is an approach to extract useful information by performing some operations like enhancing an image, cropping an image, etc. on an image. Feature extraction, remote sensing, etc. are various applications of Image processing. Testing currency notes manually is a highly tedious process and also time-consuming. Therefore a counterfeit currency detection system is developed using various Image processing methods to eliminate these problems and authenticate currency.

II. LITERATURE SURVEY

The proposed work in paper [1] is the currency recognizing system to identify fake notes which helps in reducing human effort. In MAT lab the features of the currency notes are extracted with the help of digital image processing. Then pre- processing by filtering and segmentation is completed. Patterns are extracted by Gray-Scale method. The features like Fluorescence, Identification Mark, Latency Image, Intaglio Printing, Watermark, Optically Variable link, Security Thread etc. are considered to compare the scanned image with the original notes. ORB algorithm and Template Matching techniques are most commonly used in edge detection and feature extraction to get the best outcome.

The paper [2] proposes the cash perceiving framework to perceive counterfeit monetary form and indicate it to the fiscal group. Median filter, Linear filtering, Adaptive filtering are used to remove the noise on the gray scale converted input image. This preprocessed image is taken as the input for the feature extraction. Gary level co-occurrence matrix (GLCM) is used in the feature extraction process for capturing visual content of the pictures and to extract features and statistical measurements needed and probabilistic neural networks are used for classification.

The paper [3] proposes the currency recognizing system to perceive counterfeit monetary forms and determine it to the financial divisions. Median filter, Linear filtering, Adaptive filtering are used to remove the noise on the gray scale converted input image.

This preprocessed image is taken as the input for the feature extraction. Gary level co-occurrence matrix (GLCM) is used in feature extraction process for capturing visual content of the pictures and to extract features and statistical measurements needed and probabilistic neural networks are used for classification.In paper [4] they proposed the paper currency recognition system which uses Symmetrical masks technique to find the summation of non-covered pixel esteems in every banknote and took care of a Neural Network. The general acknowledgment precision of the framework is figured at 91.5%.

III. PROPOSED WORK

The proposed system is a user friendly system that efficiently identifies the fake currency note in the most efficient manner within the required time. The input image is dynamically chosen from the dataset by clicking on the browse button. Various pre-processing techniques are performed on this image for accurate feature extraction efficiency within the required time. Fig 1 portrays the outcome flow from one module to another.

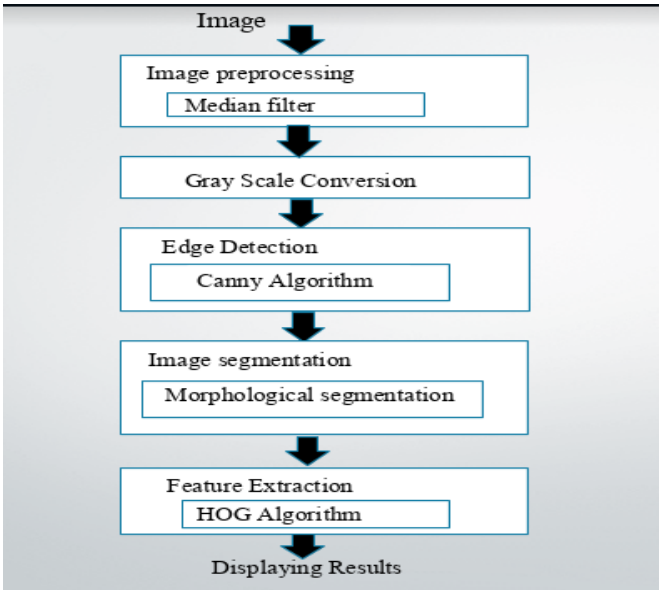


Fig 1 Block diagram

The following are the actions performed in the respective order:

1) Image acquisition
2) Image preprocessing
3) Gray scale conversion
4) Edge detection
5) Image segmentation
6) Feature extraction
7) Displaying results

IV. METHODOLOGY

A Image acquisition

Image acquisition is extraction of the note image from the dataset. This is the initial step in the process because we cannot perform next steps without having image.

B Image pre-processing

This technique is performed on the input image using median filter. By performing preprocessing noise of the image is removed. It takes user input image and gives preprocessed image as output which becomes input to grayscale.

C Gray-scale Conversion

In gray scale conversion, the RGB(24 bit) image is converted into an 8-bit image. The pre- processed image is transformed to gray scale as it is easy to identify the pixels in grayscale when compared to color image. Here getrgb() and setrgb() functions are used. The output of grayscale is illustrated in table1.

D Edge detection

The gray scale image is given as input to in this step. The goal of this module is to identify the borders of objects in the input image. Edge detection is done using canny algorithm which offers reliable detection even in the presence of noise. It takes gray scale image as input and exhibit edge detected image as output.

E Image segmentation

Image segmentation is used to highlight the darker areas and lighter areas which are easy to analyze. Here dilation and erosion are applied. Dilation sums pixels at the periphery of object. In contrast, erosion erases pixels at the edges of object. The output of this step is shown in table1.

F Feature extraction

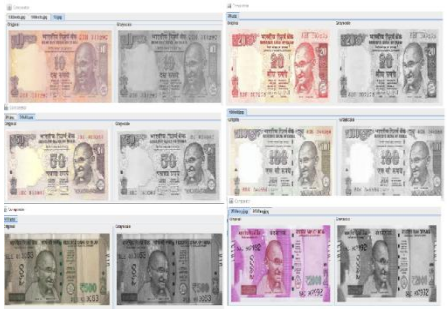
In this paper we examined three features security thread, serial number and watermark. The security thread in Indian note is 3mm and green in color. When the note is inclined the green color security thread is changed to blue. The serial number is one of the distinguishing features. It is present on the top left corner and bottom right corner in which the size of numerals increases from left to right. The watermark is nothing but the Mahatma Gandhi's portrait. When the note is kept under visible light the water mark should appear on the right side in new notes and left side in case of old notes. In this phase Histogram Oriented Gradient (HOG) algorithm is applied which pulls out the features of image effectively.

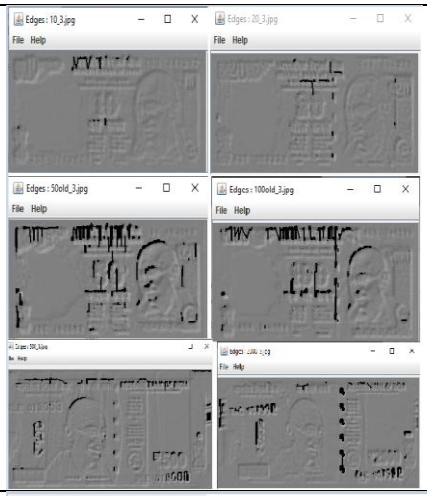
G Displaying results

The result is displayed on screen which specifies whether the note is bogus or genuine. The final output image is depicted in the table1.

V. RESULTS

Table 1 Outputs of each phase

OUTPUT IMAGE	DESCRIPTION
	Grayscale output

	Edge detection output
	Image segmentation output
	Final output

VI. CONCLUSION

The Indian monetary system has many denominations which are peculiar in one or more features. The features can be color, identification marks etc. The main objective of this system is to develop a system which differentiates bogus notes from original notes in order to lessen human efforts. This paper can be further extended by calculating the thickness of image to give results with more precision.

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AUTHORS PROFILE

Yepuri Spoorthi Hawanika is currently pursuing final year of Btech in Computer Science and Engineering at Velagapudi Ramakrishna Siddhartha Engineering College affiliated to JNTUK, Kakinada. She will complete her under graduation with Btech degree in Computer Science and Engineering in the year 2020. She is interested in the fields of Internet of Things, Data Science and Big data analytics.

Kapavarapu SaiSreeja is currently pursuing Computer Science program at VR Siddhartha Engineering College affiliated to JNTUK University, Kakinada. She will complete her under graduation in 2020 with a B.Tech degree in Computer Science. She has interest in the fields of Data Analytics, Machine Learning, Artificial Intelligence, Web Development.

Yangala Shamitha is currently pursuing B.Tech final year in Computer Science and Engineering at VR Siddhartha Engineering College affiliated to JNTUK University, Kakinada. She will complete her under graduation with B.Tech degree in 2020. She is interested in java, cyber security, Internet of Things and web technology.

Bandaru Yuva priyanka is currently pursuing B.Tech final year in Computer Science and Engineering at VR Siddhartha Engineering College affiliated to JNTUK University, Kakinada. She will complete her under graduation with B.Tech degree in 2020. Her major interests include Cyber Security, Computer networking, Graphics Design, Internet of Things.

Manam Srilatha received M.Tech degree from Jawaharlal Nehru Technological university Hyderabad. She is currently working as Assistant professor in the Computer Science and Engineering, VR Siddhartha Engineering College, Vijayawada. She is having 12 years of teaching experience .She published papers in the field of cloud computing in various reputed journals. Her research interests include cloud computing and algorithms.