Volume 3, Issue 3, March-2016, pp. 119-122 ISSN (O): 2349-7084

International Journal of Computer Engineering In Research Trends

Available online at: www.ijcert.org

Review of Various Image Processing Techniques for Currency Note Authentication

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Abstract:- In cash transactions, the biggest challenge faced is counterfeit notes. This problem is only expanding due to the technology available and many fraud cases have been uncovered. Manual detection of counterfeit notes is time consuming and inefficient and hence the need of automated counterfeit detection has raised. To tackle this problem, we studied existing systems using Matlab, which used different methods to detect fake notes.

Keywords – Counterfeit, Image Processing, Matlab, Cloud, Map Reduce

1. INTRODUCTION

Image processing is basically a technique in which an image is converted into a digital form and there are various operations performed on it in order to get an enhanced image and to extract useful information from it. The images are digitized with the help of a scanner or by a video camera which is connected to the frame grabber board in computers. This digitization is done so that it can be stored in computers memory or in a form of media storage like CD-ROMs and hard disks. The image used as input in this technique can be a video frame or photograph and the output received may be an image or some characteristics associated with that image. It is a type of signal dispensation which treats an image as two-dimensional signal by applying already set signal processing methods. In today's world, with rapid growth of technology, image processing is being used in various fields and is playing a very important role.

Image processing is done by following the below three steps

- Importing the image with optical scanner or digital photography.
- Image is then analyzed and manipulated for data compression, image enhancement and pattern recognition as they are not clearly visible to human eyes.
- Output is the last stage in which result can be altered image or report that is based on image analysis.

Image Analysis is the extraction of meaningful information from images; mainly from digital images by means of digital image processing techniques. Image analysis tasks can be as simple as reading bar-coded tags or as sophisticated as identifying a person from their face. Digital image analysis is when a computer or electric device automatically studies an image to obtain useful information from it. Apart from a computer, the electric device may also be an electric circuit, a digital camera or a mobile phone. Computer Image Analysis largely contains the fields of computer or ma-chine vision, and medical imaging, and this field makes great use of techniques like digital geometry, signal processing and pattern recognition. The field of Image analysis was developed in the 1950s. It is the quantitative or qualitative characterization of two-dimensional or three-dimensional digital images. 2D images are, for example, to be analyzed in computer vision, and 3D images in medical imaging.

In this fast-paced world with an ever expanding market, there came a great need to make optimum use of all the resources. With the massive storage of images, there came the realization that images are an indispensable source for the extraction of meaningful information. It has been rightly said that "A picture is worth a thousand words". Image Processing is need for Visualization to observe the objects that are not visible, Image sharpening and Restoration to create a better image, Image retrieval to seek for the image of interest, Measurement of pattern that Measures various objects in an image and Image Recognition to distinguish the objects in an image. Analysis of images can help us make strategic decisions in fields of business and research. With the applications of big data on the rise, it has been found that analyzing digital images with the aid of computer techniques helps to save 50% of investors' time and reduce human error.

2. LITERATURE SURVEY

We have seen a Grid Based Feature Extraction where grids are applied to the images for processing them further. The feature sets used in it are geometrical shapes to recognize the denomination, governor declaration and year of printing. There are various algorithms used for finding out these feature set which work as a part of the whole algorithm of processing. Geometrical shapes for denomination are extracted by feed forward neural network classifier, Governor Declaration by region properties and year of print by Optical Character Recognition technique. The algorithm takes the images in RGB and then converted in a binary image. A 3*3 grid is applied to the image both on the top and back side of the image to create 18 blocks. Block 4 is selected for denomination of notes where the neural network classifier extracts the shape in it further classifying the amount of the note. Block 8 is selected for calculating the maximum and minimum orientation in order to recognize the position of the Governor declaration. Block 17 is selected for recognition of year of printing, which segments the characters and matches them with the standard template using correlation technique. Correlation value range from 0-1, if the vale is 0 is said to be a minimum match and if 1 the maximum match. The experimental setup is done on sample of 90 images, where 30 images each are of rupees 100,500 and 1000.The average success rate achieved is 92.30%.The best validation performance of neural network classifier is 0.91181 at epoch 59.The advantages of using these techniques have been proved to be very efficient and accurate and have overcome the shortcoming of other algorithms for recognition of Indian currency.

In the second application, we have seen cloud computing through android platform to send the images to remote server. The feature sets used are watermark of Mahatma Gandhi, security thread, see through register, checking currency number series and identification mark. The techniques used in this are the watermark of Mahatma Gandhi has light and shade effect and multidirectional lines in watermark window which is matched with image in the database, the security thread has the words "RBI" and "Bharat" written on it which is checked with the database image, the number series has 9 characters out of which first three contain an a digit and two alphabets, the next 6 numbers are the serial numbers, this series is checked by the server to check for the real results. Identification mark is on the left side if the watermark window which has different geometrical shapes for denominations of notes, these shapes are checked with the database image to give results. See through register has a floral design on the left side between the vertical band both on the front and back side, it has the denomination printed in half on the front and the other half on the back side, both of this is compared and checked by the server. The experimental setup has the android phone and the remote server. The android phone is of high megapixel resolution which takes each of 3 images of the feature sets mentioned and sent to the server through cloud in jpg format. The server does the processing, which converts the image into gray scale and convolve with 3x3 Gaussian low-pass filters to eliminate high frequency noise. Then canny edge detection is applied to get the image in closed contours. It then matches the feature sets with the standard banknote images. If it matches appropriately, it results into a real one. The advantages of this techniques are, it is user friendly, available on the internet free of cost and is time saving. The limitations though are the android phone should be of good picture quality, the

images captured should be very clear and internet is required throughout the process. Using this technique can help common man in counterfeit should be very clear and internet is required throughout the process. Using this technique can help common man in counterfeit of currency.

Manual testing of currency notes in transactions is an untidy process as well as very time consuming which may even involve tearing of notes while handling them. In this paper, fake currency note detection technique using MATLAB and feature extraction with HSV color space is developed. The camera pictures the notes are analyzed by MATLAB program installed on computer. The project checks Indian currency notes of 100, 500, 1000 rupees. Methods to detect fake notes: See through register, Water marking, optically variable ink, Fluorescence, Security thread, Intaglio printing, latent image, Micro lettering, Identification mark. The experiment setup consisted of Operating system interfaced with input device camera and output device LCD display. First the Image Acquisition on which gray scale conversion, edge detection, image segmentation, Characteristic extraction, Comparison and then the output is obtained. The low cost system, using effective and efficient image processing techniques and algorithms, provide accurate and reliable results at good throughput as shown by experimental results. The developed algorithm works for Indian denomination 100, 500, 1000.

Fake currency detection is a process of finding the forgery currency. In this paper after we chose the image apply pre-processing. In pre-processing the image is to be cropped, smoothened and adjusted, and then the image is converted into gray color. After the conversion, image segmentation is done. The features are extracting and reduce. Finally compare the image into original or forgery. As a subcategory or field of digital signal processing, digital image processing has many advantages over analog image processing. It allows a much wider range of algorithms to be applied to the input data and can avoid problems such as the build-up of noise and signal distortion during processing. With image enhancement noise can effectively be removed by sacrificing some resolution, but this is not acceptable in many applications. In a Fluorescence Microscope resolution in the z-direction is bad as it is. More advanced image processing techniques must be applied to recover the object. A Fake currency detection using image processing and other standard methods by using various methods like watermarking, latent image, security thread and identification mark. By using layman method the fake note is detected. This paper presents the design and implementation of Indian paper currency authentication system based on feature extraction by edge based segmentation using Sobel operator. The image is taken as Input on which pre-processing, gray scale conversion, edge detection, image segmentation, comparison and output is obtained. Modules used in this paper are image acquisition, pre-processing, gray scale conversion, edge detection, image segmentation and feature extraction. Performance Metrics taken into consideration are Peak Signal-to-Noise Ratio (PSNR), Mean Squared Error Rate (MSE), SSIM, Root Mean Squared Error Rate (MSE).PSNR metric gave the highest accuracy compared to the other performance metrics.

To detect the authenticity of currency note there are two methods that is first line inspection method and second line inspection method. First line inspection method includes varied density watermarks, ultraviolet fluorescence, intaglio printing, micro text and hologram while the second line inspection methods include isocheck/isogram, fiber based certificates of authenticity, color and feature analysis. First line inspection method is used for on-spot authentication of notes but is easier to counterfeit than the second line inspection method while the second line inspection method requires an extra device to perform the inspection. The different steps in currency recognition are image acquisition the process of acquiring image from a currency note by using digital camera on which image pre-processing is done to enhance some image features important for further processing and analysis. Further edge detection for changing the image brightness, binarisation for converting the image into binary image and feature extraction takes place. The important features of an image taken into consideration are size or area, aspect ratio, color, Euler number, texture and matching algorithm. The techniques for currency recognition used

are texture based, pattern based, color based and currency localization techniques. Selection of feature and selection of tools to recognize that particular feature are critical. To overcome this limitation and building an interactive system with high speed, accuracy and cheap is a new challenge.

In this paper, we are designing a system that helps in identification of Indian currency notes and to check whether it is a valid or invalid. This is to differentiate between the counterfeit notes and genuine notes. Currency features such as See Through register, See Through register symbol or Identification mark, Security thread, Governor's signature, Micro lettering, year of print. These features are segmented using 3x3 grids. This is done using SIFT technique which helps in efficient matching of the features. The technique used in this project is extracting unique features of the Indian currency note using grid. Grid divides the currency into nine parts on each side which reduces the time complexity of the proposed model. Applying the pre-processing to each block to recognize and extract potential feature of Indian currency note. Grids 2, 6 and 15 are cropped and potential features of currency notes are extracted. This paper we are extracting the features by using SIFT algorithm. Based on the features it is gives the result as genuine are fake note and it also identifies the denomination of the currency note. The proposed method is experimented on the dataset and the result is obtained.

3. CONCLUSION

After studying the existing systems and different algorithms and techniques used for processing and analysis for identifying counterfeit in notes, we realized that the different shortcomings in them can be overcome using map reduce platform. The distributed platform provided by existing systems like Matlab does not provide an open source platform and for Cloud, we need to provide internet connectivity throughout the process .But since Hadoop is open source which provides us with Map Reduce paradigm, these shortcomings can be overcome. Also, efficiency of the system can be improved using Map Reduce.

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