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FAKE CURRENCY DETECTION USING IMAGE PROCESSING

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ABSTRACT: The advent of color printing technology has also allowed for counterfeit currency notes to be printed and duplicated on a large scale. This has been beneficial and used by those who want to work on high notes. Due to the existence of counterfeit documents, India is plagued by various problems such as black money and corruption. This has led to a sharp decline in the value of the country's currency. The following article describes an image processing system that can verify the authenticity of notes in Indian rupee.

Keywords: Image segmentation, Grayscale conversion, Edge Detection, Feature Extraction, Image Processing.

I. INTRODUCTION

Nowadays, technology is advancing at an alarming rate speed. As a result, year after year, the financial industry becomes more sophisticated. For this reason, the automatic acquisition of counterfeit cash in automatic cash machines and cash register is extremely important. A number of scientists have been pushed to create a credible and effective fundraising system. Automated note detectors are widely used in the distribution of modern products such as sweets, soft drink bottles, and bus or train tickets in modern society. The identification and disposal of tangible and intangible assets on paper money is the backbone of the technology to identify currency. To date, a number of methods have been developed to identify currency notes.

The most effective way, however, is to use the physical features of the note. For example, color and size are important factors to consider. If the note is spotted or cracked, this procedure will not work. The color characteristics of the note change significantly when it is dirty. As a result, it is important to consider how we extract the features of a currency note and how we use the appropriate algorithm to increase the accuracy of note recognition. In this example, we use a simple but effective algorithm. A computer-based digital camera is used to take photographic evidence of money note.

The secret elements of the note are exposed when exposed to UV light. Image processing is done on an acquired image using concepts such as image classification, image edge information, and extracting a standard feature. MATLAB is an excellent tool for calculating and analyzing data. In the field of digital photography, extracting elements from photographs is a daunting task. Photo capture, edge detection, gray scale conversion, feature removal, image classification, and decision making are all methods used in this method. Image capture means the process of transforming a real scene into a digital summary. The image in this sample was taken with a cheap digital camera, allowing all the features to stand out features to be highlighted. The image is then saved for later

processing. Edge Detection is an important tool in the field of image processing. It is widely used in feature detection and extraction domains. The purpose of this process is to determine the location of a digital image where the brightness of the image changes significantly.

Image fragmentation is a method of dividing an image into smaller regions. The nature of the problem determines the degree of separation. Monochromatic images are categorized using a classification method based on image attributes such as similarities.

II. METHODOLOGY

The method proposed here is based on an advanced image of ultraviolet light of a monetary note recorded by a digital camera, which is being processed later. The following is the algorithm used in this case:

1. Using a simple digital camera or scanner to capture an image of a money note under UV light is one way.
2. The acquired image was an RGB image that has now been converted to a grayscale image.
3. Detection of the image's edges in grey scale.
4. At this point, the characteristics and features of the paper currency will be sliced and segmented.
5. The qualities of the currency note are decided after segmentation.
6. The intensity of each characteristic is calculated separately.

Fig (1): Flow Chart

A. IMAGE ACQUISITION

The image of the currency that has to be checked or verified as a genuine currency is taken as an input for the system. The input image can be acquired using techniques like scanning the image or clicking a picture with the phone and then uploading it to the system.

B. GRAYSCALE CONVERSION

A pixel color in an image is a combination of three colors Red, Green, and Blue (RGB) Conversion of a color image to a grayscale image requires more knowledge about the color image. Similarly, A Grayscale image can be viewed as a single layered image. Different techniques can be used to convert a colored image to grayscale image

C.EDGE DETECTION

Edge detection is an image processing technique for finding the boundaries of objects within images. It works by detecting discontinuities in brightness. Edge detection is used for image segmentation and data extraction in areas such as image processing, computer vision, and machine vision. The purpose of detecting sharp changes in image brightness is to capture important events and changes in properties of the world. Edge detection helps to detect all the edges of the necessary ROI to perform various operations in the latter stages.

D.SEGMENTATION

Image segmentation is the process of dividing an image into multiple parts. This is typically used to identify objects or other relevant information in digital images.

E. FEATURE EXTRACTION

Feature extraction is a type of dimensionality reduction that efficiently represents interesting parts of an image as a compact feature vector. This approach is useful when image sizes are large and a reduced feature representation is required to quickly complete tasks such as image matching and retrieval. The features are extracted and then used for comparison in the further step.

F. COMPARISON

The features that are extracted from the previous step are used for comparing with the stored features and then the results are displayed as to the currency being genuine or fake.

The digital image is then compared with the default image which is present in the database and the factors that are compared to the database to determine the originality of the currency are mentioned below

1). SECURITY THREAD: It's a 3mm windowed security thread with Hindi inscriptions for India, the Reserve Bank of India, and currency denominations of 2000/500 on color-changing banknotes. The color of the thread changes from green to blue as the note is tilted.

2). SERIAL NUMBER: A serial number panel with a banknote number that develops in size from small to large is located on the top left and bottom right sides of the panel.

3). IMAGE LATENT: On the front side of the denomination, a vertical band in the righthand size is featured. The currency has a latent representation of the denomination's numeral when held horizontally at eye level.

4). WATERMARK: The face of Mahatma Gandhi, as well as multidirectional lines and a mark displaying the denominational numeral, can all be seen clearly when the object is held up to the light.

5). MARK of IDENTIFICATION: A mark on a bill with an intaglio print that can be felt helps a blind person to recognize the denomination. The 500-dollar denomination's mark has five lines, whereas the 2000-dollar denomination's mark has seven lines. The following is a flow diagram of the process that will be followed in the proposed

Fig (2): Block Diagram

III. PROCESS

A. IMAGE CAPTURE: The image is captured using a simple digital camera and stored under ultraviolet light.

Fig (3): Acquired Image

B. Image preprocessing refers to a series of procedures that must be accomplished prior to data analysis and information extraction. This is where the image scaling is finished.

C. GRAYSCALE CONVERSION AND EDGE DETECTION: The acquired image is captured as an RGB image, which is subsequently transformed to a grey scale image because it contains intensity information. On this image, an additional processing step is conducted, and the grey scale image edges are revealed.

Fig (4): gray scale image

D. "**IMAGE SEGMENTATION**" refers to the technique of splitting an image into many parts by cropping it.

Fig (5): identification mark

E. **FEATURE EXTRACTION:** The final stage is to extract the features using edge-based segmentation.

Fig (6): Edge based segmentation of Mahatma Gandhi portrait.

F. The procedure of determining the intensity of each extracted feature is completed in this stage. The note is classified as genuine if the computed intensity is greater than 70 percent; otherwise, it is categorized as a fake or counterfeit.

Fig (7): Segmentation of security thread

G. The final decision is made based on the intensity of all of the retrieved features.

Fig (8): flow chart for decision making

The experiment's conclusion

The results are shown in a MATLAB-based graphical user interface (GUI) that shows extracted data such the security thread and serial number.

Fig (9) testing of 500 rupee note

IV. CONCLUSION

MATLAB was used to detect counterfeit money through image processing. The serial number, security thread, identification symbol, and portrait of Mahatma Gandhi were all removed from the currency note and studied. The procedure starts with the image capture and then moves on to calculating the intensity of each extracted feature. Even if there are scribbles on the letter, the algorithm can still extract information from it. The technique used here, according to our tests, is suitable for the recently announced 500 and 2000 denominations. The proposed system can also be implemented in hardware with the use of a suitable CPU in order to improve detection speed and CPU in order to improve detection speed and therefore efficiency.

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