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Currency recognition and fake currency identification using image processing

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ABSTRACT

Around 150+ currencies exist in the world. Each currency differs from the other on the basis of size, paper, colors, patterns, text, etc. It is difficult to identify all the currencies that exist. Also, it is difficult to determine whether a currency is real or fake. Our system proposes to tackle this problem using Image Processing in MATLAB. The different types of currencies from the different origin are provided to the system and system then performs Image Processing operations depending on the currencies and provide the identified currency type as an output. Also to authenticate currency is real or fake it performs Image Processing functions and identifies the currency provided as an input is real or fake.

Keywords— *Currencies, Patterns, Texts, Identify, Real or fake, Authentication, Image processing, Matlab*

1. INTRODUCTION

All currencies are entirely different from one another. The paper, text, color, pattern, size are different. It is not easy to identify all the types of currencies. People in the banking field or money exchange offices may identify the currencies however human errors may occur which cannot be neglected. But for most staffs, they have to keep a lot of different characteristics and anti-fakes label for different commonly-used currencies in their mind. However, each of them has a handbook about the characteristics and anti-fakes labels of some less commonly-used currencies. With different currencies and different types of paper, errors might occur in identifying if the currency is real or not. To overcome such problems, our system works on currency identification as well as detection.

Various factors need to be analyzed to check whether a currency is fake or real. The paper, size, print, text, color and patterns are some important features that are taken into consideration while checking if a currency note is fake or real. However, the main feature is the black strip present on every note. This project checks the black strip and concludes about the authenticity of the currency.

The aim of our Project is to identify different currencies and check whether the currency is real or fake. This system uses an Image Processing mechanism to identify them. Various operations such as edge detection, filtering and feature extraction are performed on the currency image.

2. LITERATURE SURVEY

An intelligent system for paper currency identification is developed which is required for currency automation systems. This system verifies 110 images. The data set of the image consists of various types of images including normal images, images with noise and mixed images. This paper claims an accuracy of 91.65%. This system provides quite satisfactory results. Tit he steps are: Image acquisition, processing, feature extraction, comparison and results. [1]

Currency identification is a difficult task as each currency has a different color, pattern, size, etc. This system uses Image Processing and includes image filtering, edge detection and filtering. It uses currency in HSV components by fixing saturation and threshold for recognition. [2]

This algorithm uses some important features which are extracted from the currency note. The algorithm utilises two images. One is the original image of paper currency and other is to test currency which has to be verified. This paper has verified 5 currencies: Rupee, Australian Dollar, Euro, Riyal and US Dollar. It works precisely for all notes except the US Dollar. The US Dollar notes differ for each currency and hence it is difficult to recognize. [3]

This paper works with the paper of the currency where in a linear array of photodiode and phototransistor are positioned on opposite sides to verify the paper under transmitted light. The focus is adjusted on the top surface of the currency paper. Comparison is made with the existing data and the currency is verified.

This paper determines if the currency is fake or real. It works on the currency of Bangladesh. Due to modern technologies, it has become easy to generate fake currency notes. Therefore, with the help of Image Processing, this system checks the authenticity of the currency. It does Image Smoothening, Image Conversion, Segmentation, Feature Extraction and Pattern matching.

3. PROPOSED METHODOLOGY

This Project includes two modules: One is to identify the type/country of the currency. The second module determines the authenticity of the currency.

3.1 Identify currency

To identify the currency the features of the image are extracted and compared with the data in the database. Many factors are considered to determine the type. Each currency has a different size, pattern and colour. These features are extracted from the image and compared with existing data.

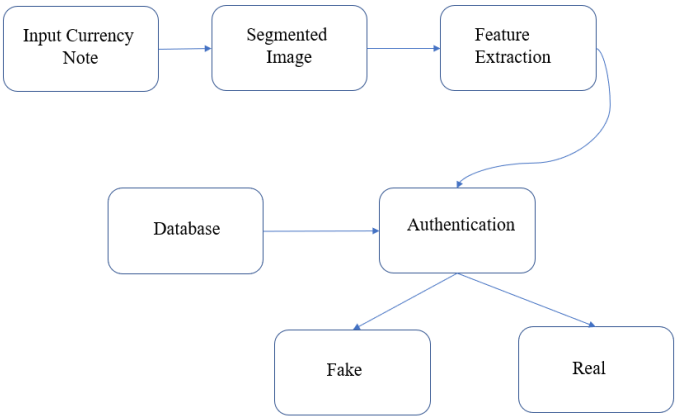

Fig. 1: Block diagram

3.2 Algorithm

Step 1: Obtain the Image of the currency that has to be identified.
Step 2: Use Image Processing to identify the features if the currency.
Step 3: Detect the edges in the image.
Step 4: Extract the features and compare with the database.
Step 5: Display the results

The operations in image processing include noise removal, gray scale conversion, color model transformation, edge detection, etc. These operations help in determining the features of the currency.

A database includes the features and the name of the currency. The extracted features are compared with the database values and when a match is found, the name mapped along with the output is returned. The database contains information on currencies like Rupee, Dollar, Pound, etc. The mapped name is displayed as a result.

3.3 The tasks performed are as follows

The main steps in the system are:
(a) Read an image, reading the image we get from the scanner as well as the format of the image is JPEG.
(b) Pre-processing, removing noise, smoothening image.
(c) Image process, edge detection, segmentation, pattern matching.
(d) Results printing.

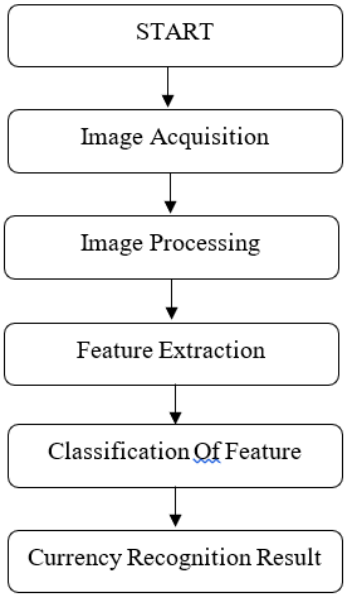

Fig. 2: Steps of algorithm

3.4 Algorithm to identify fake currency

Step 1: Read Images
Step 2: Extract the columns of the images where the black strip is present
Step 3: Convert images to grayscale using rgb2gray
Step 4: Threshold the image using intensity value 30. And convert it into a binary format using im2bw
Step 5: Area open the image by specifying the area u want to get rid of noisy pixel
Step 6: Close using square structure so that all pixels will get compact
Step 7: Count the total number of object present, if 1 note is real and if not equal to 1 then the note is fake.

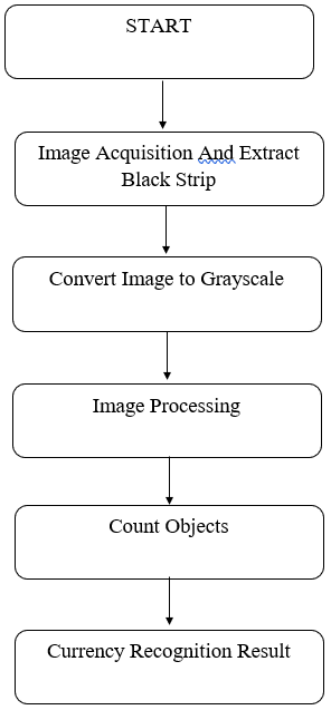

Fig. 3: Steps of Algorithm to identify fake currency

3.5 Applications

- Authentication Purpose
- Duplicate Identification
- Currency Segregation

4. RESULTS

4.1 Identification

Table 1: Identification result

Input	Actual Output	Expected Output
Rupee	rupee	rupee
Pound	pound	pound
Dollar	dollar	dollar
Yen	yen	yen

4.2 Authenticity

Table 2: Authenticity results

Input	Actual Output	Expected Output
Old 500 Rupee	Fake	Fake
Old 1000 Rupee	Fake	Fake
2000 Rupee	Real	Real
New 500 Rupee	Fake	Real

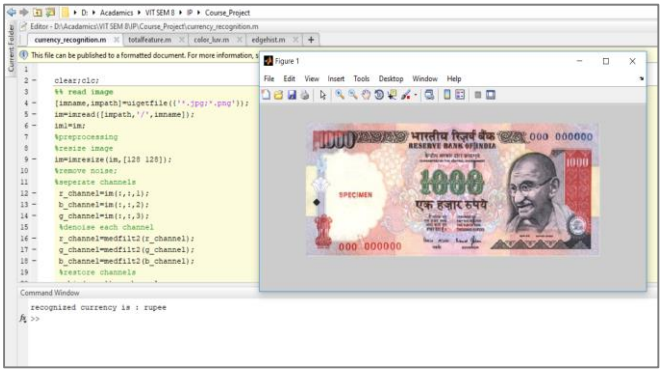

Fig. 4: Recognition of Rupee

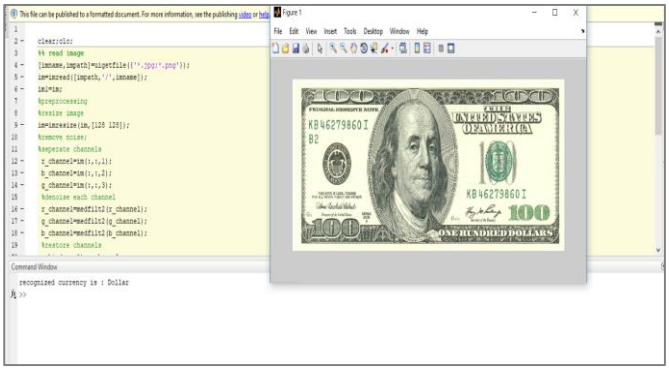

Fig. 5: Recognition of Dollar

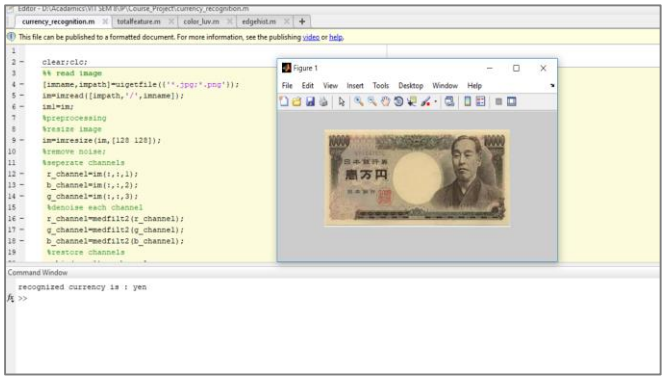

Fig. 6: Recognition of Yen

Fig. 7: Recognition of Pound

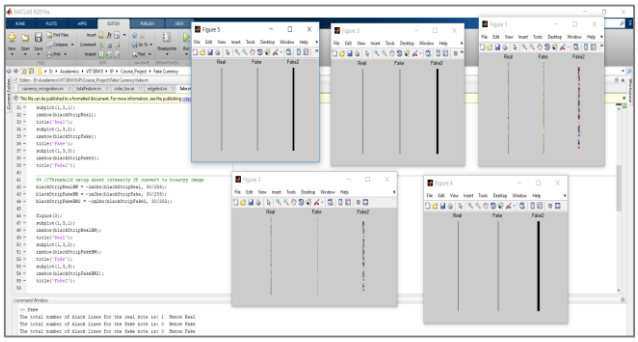

Fig. 8: Identification of Fake Currency

5. CONCLUSION

In this Project, we have successfully identified currencies of 4 different countries based on the features extracted from the image. The currencies identified are Rupee, Dollar, Pound and Yen.

The fake currency module also determines whether a currency is fake or real by comparing the metallic black strip present on the Indian notes. Both the modules work accurately and efficiently.

6. FUTURE WORK

Different currency types can be added to this system for identification. Other factors of the currency can also be utilized and compared to check the authenticity of the currency.

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