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**Currency Recognition System  
Using Image Processing**

A Report for the Evaluation 3 of Project 2

*Submitted by*

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*in partial of fulfilment for the award of the degree of*

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**Under the Supervision of**

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**SCHOOL OF COMPUTING SCIENCE AND  
ENGINEERING**

**BONAFIED CERTIFICATE**

Certified that this project report "CURRENCY RECOGNITION

SYSTEM USING IMAGE PROCESSING" is the bonafied work of

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### • Abstract

For nation like India, it is turning out to be huge obstacle. In light of the advances in printing, checking advances it is effectively workable for an individual to print counterfeit notes with utilization of most recent equipment apparatuses and incredible mechanical advances in shading printing, copying and filtering, forging issues have gotten increasingly genuine. In past just approved printing house can make cash paper, yet now a days it is workable for anybody to print counterfeit certified receipt with the assistance of present day innovation, for example, PC, laser printer. Counterfeit notes are consuming inquiries in pretty much every nation. Like others nation Bangladesh has likewise hit truly heard and has become an

extremely intense issue. This is a provoking issue to framework architects. Consistently RBI (Reserve bank of India) face the fake cash notes or demolished notes. Treatment of enormous volume of fake notes forces extra issues. Accordingly, including machines (freely or as help to the human specialists) makes notes acknowledgment process less complex and productive

In this manner there is a need to structure a money acknowledgment framework that can without much of a stretch have any kind of effect among genuine and counterfeit banknote and the procedure will tedious. Our framework depicts a methodology for check of Bangladeshi cash banknotes. The cash will be checked by utilizing picture preparing methods. The picture positions upheld by BMP, HDF, JPEG, PCX, TIFF, XWV, PNG, etc.

The methodology comprises of various segments including picture preparing, picture division, highlight extraction, looking at pictures. The framework is structured by MATLAB. Picture handling includes changing the idea of a picture so as to improve its pictorial data for human translation. The picture handling programming is an assortment of capacities that expands the ability of the MATLAB numeric figuring condition. The outcome will be whether money is genuine or fake. To tackle this serious issue, a framework is built up that will identify the cash whether it is fake or genuine. For instance, Bangladeshi money is utilized for examination. It's hard for the individuals to separate the genuine and the fake currency standards. In Bangladesh, fake notes are accessible. Truth be told, the bank laborers can't recognize the difference between the genuine and the fake currency standards since they check the notes in uncovered eyes thus their observation can not be right now and again. For this conventional individuals can be cheated whenever. And furthermore this causes an augmentation of doing numerous criminal offenses

**Keywords:** - Image Pre-processing, Conversion, Segmentation, Feature extraction ,Currency Recognition

## 1-Introduction

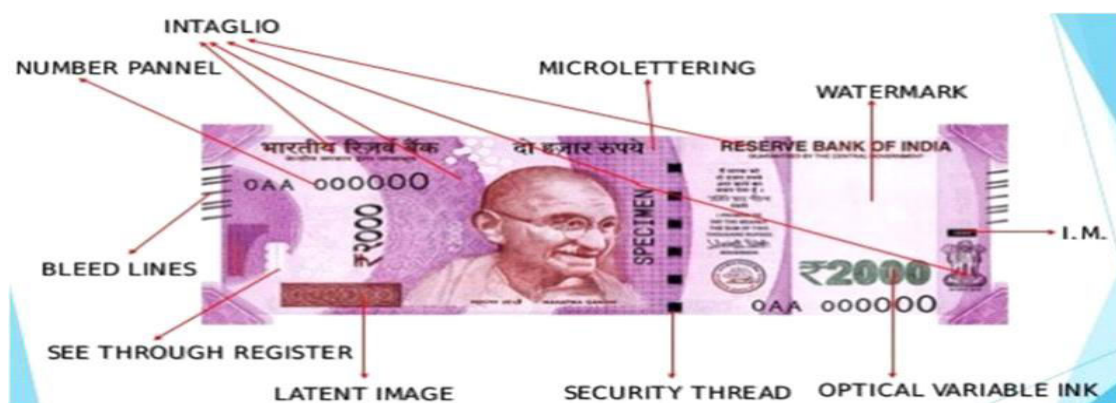
It's hard for the individuals to separate the genuine and the fake currency standards. In Bangladesh, fake notes are accessible. Truth be told, the bank laborers can't recognize the difference between the genuine and the fake currency standards since they check the notes in uncovered eyes thus their observation can not be right now and again. For this conventional individuals can be cheated whenever. And furthermore this causes an augmentation of doing numerous criminal offenses. To tackle this serious issue, a framework is built up that will identify the cash whether it is fake or genuine. For instance, Bangladeshi money is utilized for examination. In light of the advances in printing, checking advances it is effectively workable for an individual to print counterfeit notes with utilization of most recent equipment apparatuses and incredible mechanical advances in shading printing, copying and filtering, forging issues have gotten increasingly genuine. In past just approved printing house can make cash paper, yet now a days it is workable for anybody to print counterfeit certified receipt with the assistance of present day innovation, for example, PC, laser printer

The framework presents the picture preparing framework containing all the important procedures, for example, picture examining and perusing, picture pre-handling, division, highlight extraction and so on alongside a code that is done in MATLAB programming. So this framework is spoken to as an identifier of the fake and genuine currency standards. MATLAB is the computational instrument of decision for look into advancement and examination. The picture positions upheld by BMP, HDF, JPEG, PCX, TIFF, XWV, PNG, etc.

Manual testing of all notes in exchanges is very boring and messy procedure and furthermore there is an opportunity of tearing while at the same time giving notes. In this way Automatic techniques for certified receipt acknowledgment are required in numerous applications, for example, programmed selling products and candy machines. Removing adequate money related attributes from the cash picture is basic for exactness and strength of the mechanized framework. This is a provoking issue to framework architects. Consistently RBI (Reserve bank of India) face the fake cash notes or demolished notes. Treatment of enormous volume of fake notes forces extra issues. Accordingly, including machines (freely or as help to the human specialists) makes notes acknowledgment process less complex and productive.

Fake cash is impersonation money created without the legitimate approval of the state or government. Creating or utilizing fake cash is a type of misrepresentation or fraud. Forging is nearly as old as cash itself. Plated duplicates have been found of Lydian coins which are believed to be among the primary western coins. Prior to the presentation of paper cash, the most pervasive technique for falsifying included blending base metals in with unadulterated gold or silver. A type of falsifying is the creation of records by authentic printers because of deceitful directions.

#### .Security features of the a note



We propose a framework where the acknowledgment of money notes should be possible naturally dependent on the mix of improvement, division and highlight extraction technique under picture preparing. First we gain the pictures under equipment arrangement which comprises of camera mounted inside the container with the game plan of UV light, Normal LED light alongside multicolor LED's. The equipment arrangement is interfaced with the PC utilizing USB port of web-camera. When the force gracefully on, the pictures are caught

utilizing webcam programming by setting the diverse cash notes inside the container arrangement. The gained pictures are given as the contribution for the program made in the MATLAB programming. Viewpoint Ratio is determined at first. In light of the AR, it is grouped that the given note is 100, 500 or 2000.

Entropy and Mean go about as the primary element extraction procedure which is applied for all the pictures and the qualities are gathered. Subsequent to running the program, we will get the outcomes to such an extent that the chart is plotted between the genuine note and the phony note under various modes and frequencies. Subsequently we can ready to acquire the edge esteem which go about as the inside between genuine notes and phony notes. The utility of low-goals pictures of money notes procured from camera is inspected to learn the exhibition. The various Features in the note are distinguished and separated dependent on ROI extraction technique by setting the width and stature of the ROI parcel. The removed highlights are analyzed between genuine note and phony note. Entropy is applied and the entropy esteem is thought about between the two. Through the distinction in entropy esteems, we can arrange that the given note is genuine note or fake note.

The element extraction incorporates the extraction of highlights of sequential quantities of cash notes. During this procedure, the dimensionality of information was decreased. Highlight extraction or choice was a crucial strategy impressively for cash acknowledgment, which impacts on structure and execution of the classifier seriously.

Essentially, from the start occasion, individuals may not focus on the subtleties and accurate attributes of banknotes for their acknowledgment, rather they consider the basic qualities of banknotes, for example, the size, the foundation shading (the fundamental shading), and surface present on the banknotes.

### 1.2-Pattern Matching:

Pattern Matching is used for identification. Pattern Matching identifying the real note and fake note.

### 1.3-Identify the country of origin:

Once the pre-handling steps have been done, we can recognize which locales of the note are generally unfilled (dark pixels in the paired picture). This is done dependent on certain predefined zones. All the monetary forms are bunched into bunches dependent on which districts of the note are moderately vacant. We have decided to partition them into 3 gatherings – left side unfilled, right side vacant, and focus vacant, in spite of the fact that if the quantity of monetary standards were bigger, we might utilize a bigger arrangement of gatherings (top vacant, base vacant, and so forth.). Gathering is finished by discovering the proportion of dark to white pixels for the necessary district, and afterward grouping the note dependent on this proportion. The qualities picked to group the notes have been found tentatively. Note that a few notes have no noteworthy void space, and in this way don't fall into any of the gatherings. These notes are ordered into another gathering.

### 1.4-Using template matching to identify country of origin:

The formats are picked to be uniform images, for example, the nation's seal, name of the nation itself in adapted textual style, and so on. We can likewise layout coordinate the given

banknote in just the district that we realize a specific image will be, if the area is uniform over all categories.

1.5-Identify the denomination:

In the previous step we identify the country. After identifying the country we can identify the value of note. For identify the note value we apply three different approaches.

a)-Size Ratio

b)-Color

c)-Text Extraction

## **2.Existing Syastem**

### **2.1-Image Scanning and Reading:**

The picture we get from scanner is designed by JPEG. JPEG (Joint Photographic Experts Group) is a standard for damaging or misfortune bargaining for advanced pictures. At the point when you spare the picture as JPEG, the picture will lose some data, and this can't be recouped. What's more, after that the JPEG picture is perused utilizing MATLAB code.

### **2.2-Image Smoothing:**

While performing picture moves, some commotion may show up on the picture. Evacuating the commotion is a significant advance when picture handling is being performed. Anyway clamor may influence division and example coordinating. Cover esteems can be utilized to decide the level of smoothening and to diminish clamor.

### **2.3-Image segmentation:**

The consequence of picture division is a lot of portions that all things considered spread the whole picture, or a lot of shapes removed from the picture. Every one of the pixels in an area is comparative regarding some trademark or figured property, for example, shading, power, or surface. Contiguous areas are fundamentally unique as for a similar trademark.

### **2.4-Conversions:**

Conversions are two types-

a)-Gray Scale Conversion.

b)-Binary Scale Conversion

a)-Gray Scale Conversion:-

Gray Scale Conversion is describe the colors from black to white.Gray Scale Conversion generated by the mixing of two color.We converted RGB to Gray.



### **b)-Binary Scale Conversion:-**

A paired picture is a computerized picture that has just two potential qualities for every pixel. Normally the two hues utilized for a double picture are highly contrasting. We utilize paired transformation for legitimate division.

### **2.5-Scanned Image:**

An advanced picture check adopts a comparative strategy to the second sort of photograph sensor, however as opposed to utilizing one lattice for every segment, it utilizes one cluster for every segment. A scanner is expected to check the cash both of genuine and fake.

We will get the outcomes to such an extent that the chart is plotted between the genuine note and the phony note under various modes and frequencies. Hence we can ready to acquire the limit esteem which go about as the middle between genuine notes and fake notes.

## **3-Proposed system**

We propose a framework where the acknowledgment of cash notes should be possible consequently dependent on the mix of upgrade, division and highlight extraction strategy under picture handling. First we secure the pictures under equipment arrangement which comprises of camera mounted inside the crate with the game plan of UV light, Normal LED light alongside multicolor LED's. The equipment arrangement is interfaced with the PC utilizing USB port of web-camera. When the force gracefully on, the pictures are caught utilizing webcam programming by setting the distinctive cash notes inside the crate arrangement. The obtained pictures are given as the contribution for the program made in the MATLAB programming. Perspective Ratio is determined at first. In light of the AR, it is ordered that the given note is 100, 500 or 2000.

### **3.1-Hyperspectral Imaging:**

With noteworthy advances in printing and creation gear, the creation and dissemination of inauthentic cash notes have gotten progressively complex. Despite the fact that there are propelled recognition and examination techniques for fake money notes and antiques, most require costly research center seat top hardware that require point by point preparing, and are generally delayed to gather and dissect information. A portion of these need expound test taking care of and situating, and as often as possible can't be taken into the field.

This specialized note presents a straightforward fluorescence-based hyperspectral-imaging strategy for recognizing and dissecting the quality or genuineness of cash notes and antiques utilizing 365 nm Ultraviolet (UV) Bulb. All the picture and ghostly information are gathered by catching preview by means of camera.



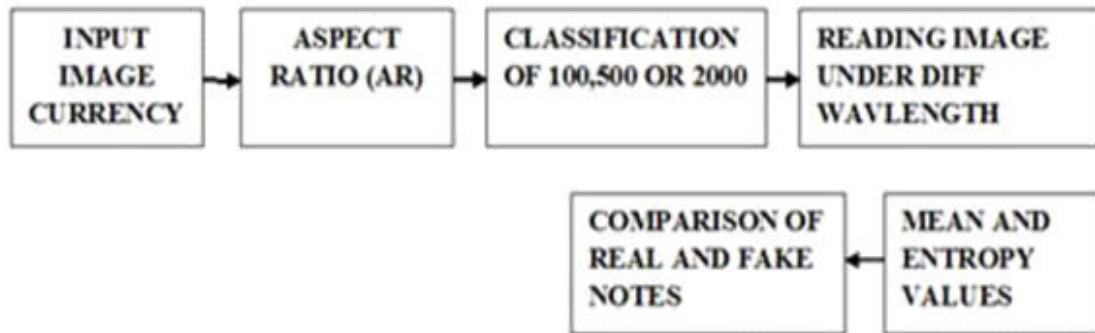


Figure of Block diagrams of the proposed system of hyperspectral imaging.

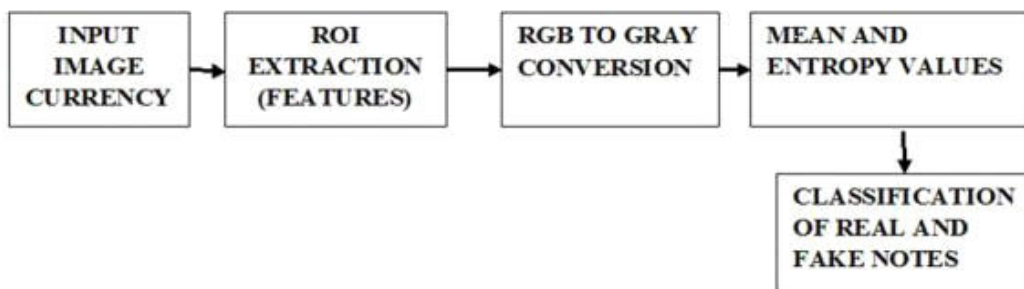
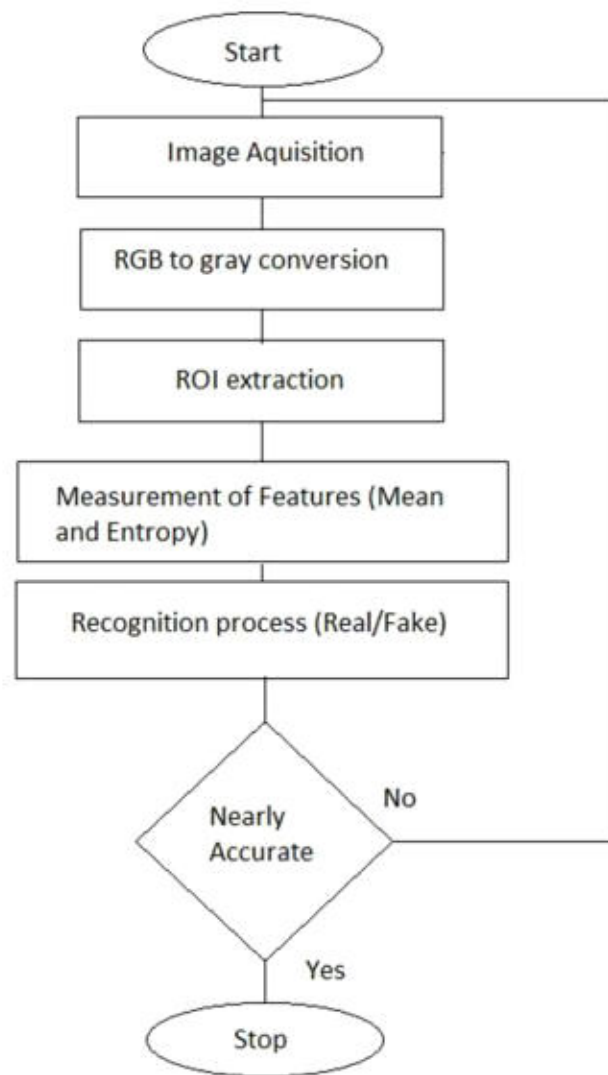


Figure of Block diagram of the proposed system of image processing.

Entropy and Mean go about as the fundamental component extraction method which is applied for all the pictures and the qualities are gathered. Subsequent to running the program, we will get the outcomes with the end goal that the diagram is plotted between the genuine note and the phony note under various modes and frequencies. In this manner we can ready to get the limit esteem which go about as the middle between genuine notes and phony notes. The utility of low-goals pictures of cash notes gained from camera is inspected to find out the exhibition. The various Features in the note are identified and separated dependent on ROI extraction technique by setting the width and tallness of the ROI divide. The separated highlights are looked at between genuine note and phony note. Entropy is applied and the entropy esteem is analyzed between the two. Through the distinction in entropy esteems, we can characterize that the given note is genuine note or phony note.

Flowchart of the proposed system



#### 4-IMPLIMENTION

The execution stage with respect to the assignment is that the total point is basically changed enthusiastic about running code. Mean in regards to the stage is towards deciphering the point enthusiastic about a best likely outcome inside a suitable customized language. In this segment, it conceals the execution stage concerning the assignment, giving points of interest seeing the modified language just as progress foundation utilized. It too gives a general thought regarding the significant areas with respect to the errand by methods for its a little bit at a time course.

The execution stage includes the accompanying errands -

- 1) Cautious booking.
- 2) Examination viewing structure just as imperatives.
- 3) Aim concerning the procedures towards achieving the transformation.

4) Assessment concerning the transformation procedure.

5) Accurate judgment about the picking of the proposition.

A. Programming Used the important program in regards to private PC that includes arrangement as determined as follows:-

1) Windows 7(64-piece) working framework.

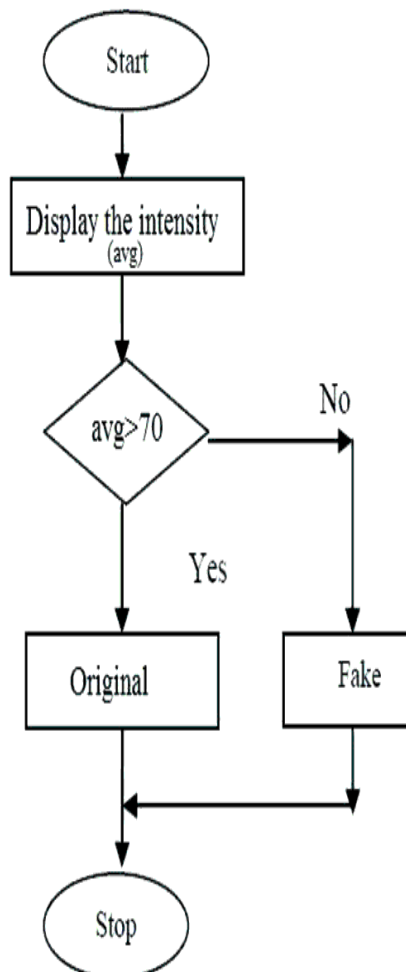
2) MATLAB 7.14 Version R2012a

B. Picture Processing Toolbox Image preparing gadget box licenses completing picture improvement of picture, trademark distinguishing proof, diminishing of clamor, picture division, arithmetical modification, just as enrollment of picture. Picture handling gadget planned for the execution with respect to strategies proposed are indicated beneath:-

1) Fundamental import just as fare

2) Display

Flow Chart for decision making:-



Algorithm:-

Distinguishing proof utilizing void areas (in the inside, left, or right bits of the note)

- 1 Convert the picture to high contrast
- 2 Extract the middle area
- 3 Calculate r as the proportion of number of dark pixels to the quantity of white pixels
- 4 Identification utilizing layouts
  - 4.1 if '4 headed lion' layout matches
    - 4.1.1 then 1.1: Output: Indian Rupee
    - 4.1.2: Determine group utilizing K-implies bunching
- 5 end.

CODE:-

```
import cv2
import numpy as np
import os
import json
import requests
import window

def rec_currency(filename,self):
    print("===== Recognizing =====")
    currencydata=[
        {
            "id": 1,
            "value": 1,
            "currency": "Indian Rupee"
        },{
            "id": 2,
            "value": 1,
            "currency": "Indian Rupee"
        },{
            "id": 3,
            "value": 1,
            "currency": "Indian Rupee"
        },{
            "id": 4,
            "value": 1,

            "currency": "Indian Rupee"
        },{
            "id": 5,
```

```
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```

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},{
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```



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"id": 69,
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},{  
"id": 81,  
"value": 1,  
"currency": "American Dollar"
```

```

    },{
        "id": 82,
        "value": 1,
        "currency": "American Dollar"
    },{
        "id": 83,
        "value": 2,
        "currency": "American Dollar"
    }
]
img = cv2.imread(filename)
gray_img = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)
temp = "0"
entries = os.listdir("trained_data/")
for entry in entries:

    template = cv2.imread("trained_data/"+entry, cv2.THRESH_BINARY)
    w, h = template.shape[::-1]
    result = cv2.matchTemplate(gray_img, template, cv2.TM_CCOEFF_NORMED)
    loc = np.where(result >= 0.4)
    for pt in zip(*loc[::-1]):
        cv2.rectangle(img, pt, (pt[0] + w, pt[1] + h), (0, 255, 0), 0)
        temp=entry
        break
imageid = temp.replace(".jpg", "")
print(">>> Recognized with Image Id : " + imageid)
if imageid is None:
    window.windows.error("Sorry Image Not Recognised")
else:
    imageid = int(imageid) - 1
    if currencydata[int(imageid)]['currency'] == "Indian Rupee":
        url = "https://api.exchangeratesapi.io/latest?base=INR"
        response = requests.get(url)
        data = response.text
        parsed = json.loads(data)
        date = parsed["date"]
        eur_rate = parsed["rates"]["EUR"]
        usd_rate = parsed["rates"]["USD"]
        print("Currency Value : " , currencydata[int(imageid)]['value'])
        print("Currency Name : " , currencydata[int(imageid)]['currency'])
        print("Currency value In EUR:" , eur_rate * currencydata[int(imageid)]['value'])

        print("Currency value In USD:" , usd_rate * currencydata[int(imageid)]['value'] )
        curvalue = currencydata[int(imageid)]['value']
        curname = currencydata[int(imageid)]['currency']
        curreur = eur_rate * currencydata[int(imageid)]['value']
        currusd = usd_rate * currencydata[int(imageid)]['value']
        window.windows.getind(curvalue, curname, curreur, currusd, self)

```

```

else:
    url = "https://api.exchangeratesapi.io/latest?base=USD"
    response = requests.get(url)
    data = response.text
    parsed = json.loads(data)
    eur_rate = parsed["rates"]["EUR"]
    inr_rate = parsed["rates"]["INR"]
    print("Currency Value : " , currencydata[int(imageid)]['value'])
    print("Currency Name : " , currencydata[int(imageid)]['currency'])
    print("Currency value In EUR:" , currencydata[int(imageid)]['value'] * eur_rate)
    print("Currency value In INR:" , currencydata[int(imageid)]['value'] * inr_rate )
    currvalue = currencydata[int(imageid)]['value']
    curname = currencydata[int(imageid)]['currency']
    curreur = currencydata[int(imageid)]['value'] * eur_rate
    currinr = currencydata[int(imageid)]['value'] * inr_rate
    window.windows.getusd(currvalue, curname, curreur, currinr,self)

```

## **5-Result**

In this segment results get subsequent to performing morphological picture handling activity. A unique picture is perused from database

Highlight Extraction is strategy for catching visual substance of pictures for ordering and retrieval. Crude or low level picture highlights can be either broad highlights, for example, extraction of shading, surface a shape or space explicit highlights. The aftereffects of the highlights extraction are determined and contrasted and the put away qualities gives yield of the Recognition

Results are produced bit by bit

1-Gride line of note.

2-Gandhi security highlight of the note

3-Ashoka insignia highlight of the note

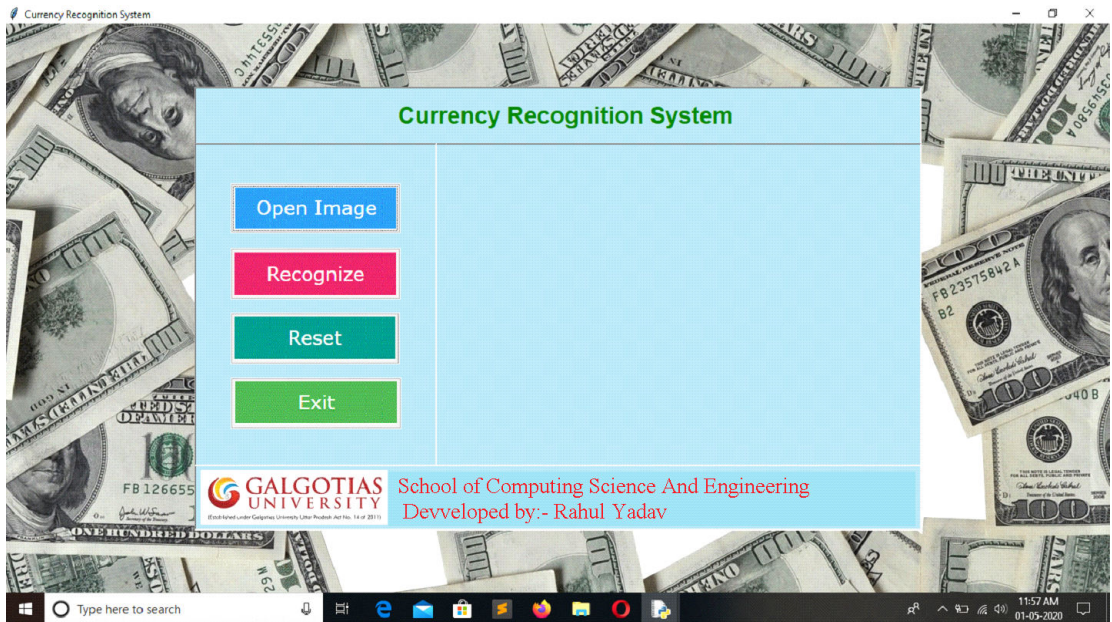
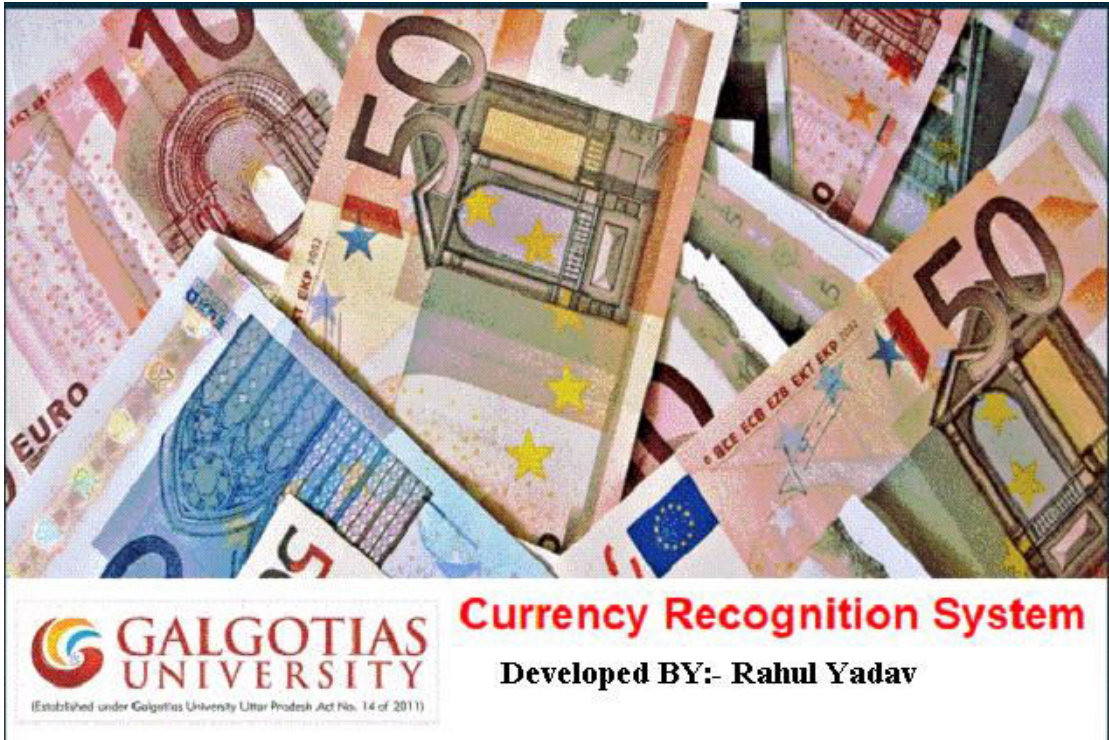
4-Identification highlight of the note

5-RBI highlight of the note

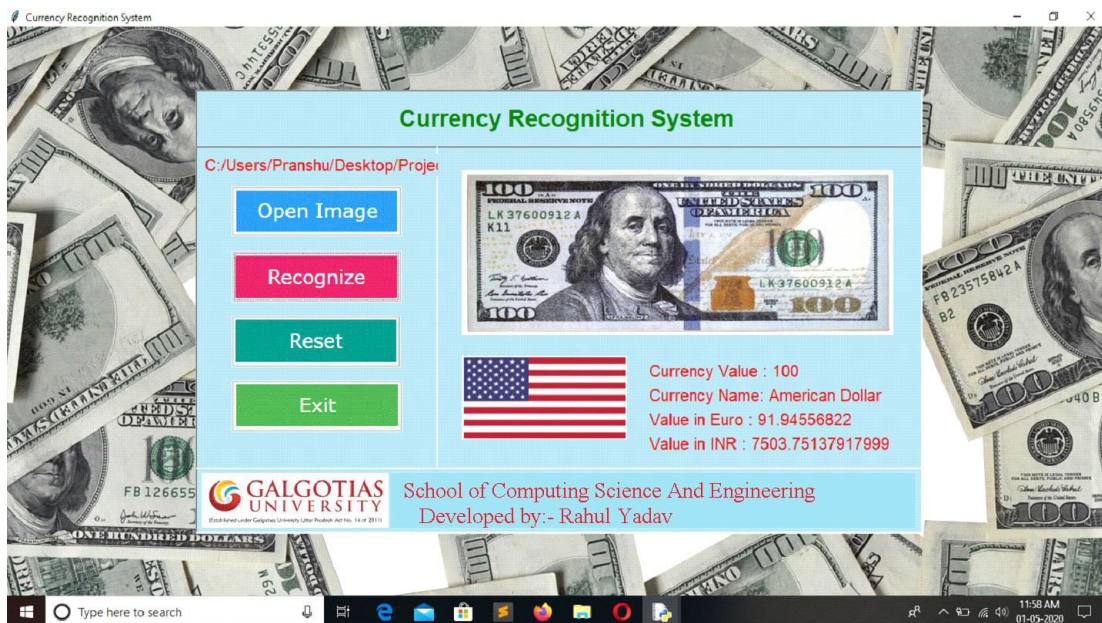
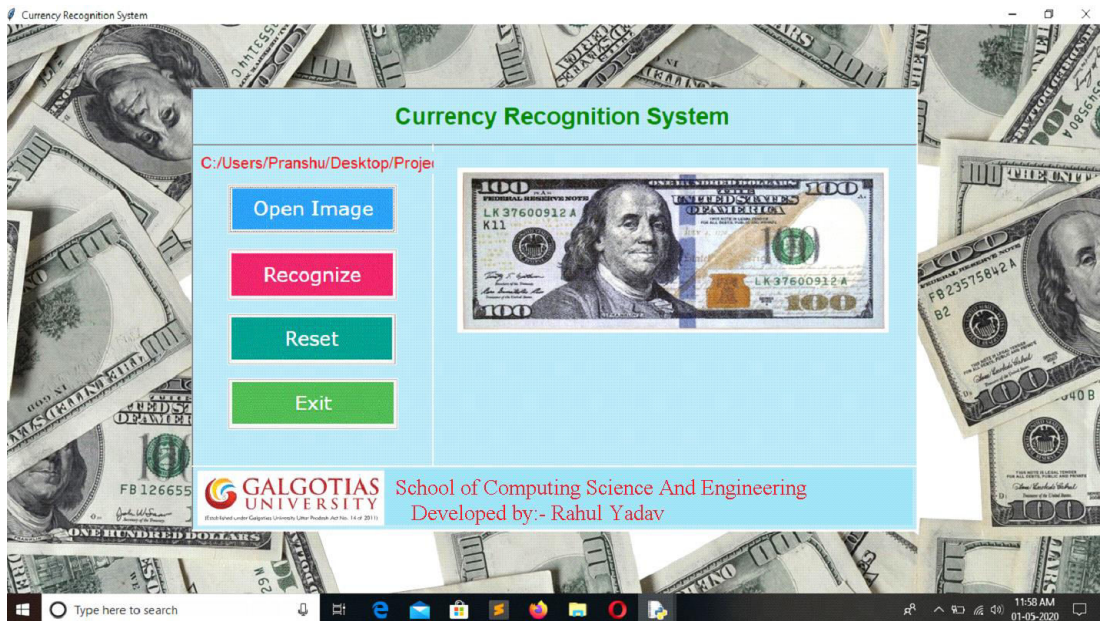
6-Rupee highlight of the note

7-Thread highlight of the note

8-Recognition of the note







## 6-Conclusion

We executed our proposed thought in two different ways: one by utilizing examination through hyper ghostly imaging and the subsequent one is the Extraction of various highlights in phony and genuine money notes and through contrasting and each other we can ready to separate the phony note from the genuine note. We incorporated these two precise methodologies in our proposed work. The distinctive shading lights utilized for imaging are Ultraviolet (UV) light, Normal LED Bulb, Red LED light, Green LED light and Blue LED light with various frequencies extending from 360 nm to 800nm individually. In picture preparing part, The various highlights present in the testing input note is distinguished and contrasted and the genuine note and results as the given note is phony or not. Entropy is



[%2520Proakis%2520and%2520Manolakis\(1\).pdf&usg=AFQjCNGtp8oF3h2hCdnBceODsgcLjh5VA&sig2=h9EtD4P43GjGTsRjXJhbjA&bvm=bv.103627116,d.dGo"](#)

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