Currency Recogntion System Using Image Processing

A Report for the Evaluation 3 of Project 2

Submitted by

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Abstract:

In this paper, we propose a system for automated currency recognition using image processing techniques. The proposed method can be used for recognizing both the country or origin as well as the denomination or value of a given banknote. Only paper currencies have been considered. This method works by first identifying the country of origin using certain predefined areas of interest, and then extracting the currency value and name using characteristics such as size, colour, or text on the note, depending on how much the notes within the same country differ. We have considered 2 of the most traded currencies, as well as their denominations. Our system is able to accurately and quickly identify test note.

Introduction:

According to the survey conducted by the CIA, there are around 180+ currencies presently circulating in the world. Each of these currencies differs greatly in features such as size, colour and texture. Unlike the olden times, the trade and commerce between countries has increased in all sorts of levels. The need for acquiring knowledge about all the currencies by the banks has been extremely important. However for any human teller to recognize each note correctly is something that is not feasible. Thus the need for an efficient automated system that helps in recognizing notes is pivotal for the future.

(i) Overall Description:

Our system is based on image processing and makes the process automatic and robust. We use SEK and Chinese RMB as examples to illustrate the technique. Colour and shape information are used in our system.

This system is based on our knowledge about computer science technologies like; Digital Image Processing, python and also a small step to implement in a system which is most important for industrial development.

(ii) Purpose:

The proposed system will help common people for currency recognition anywhere anytime. When peoples see new currency which doesn't belong to their native country then they face many issues in recognizing that currency's value, origin country and also face difficulties in finding exchange rate. That's our system which

will help to find currency value, currency name and exchange rate along with inserted currency image.

Our system is based on image processing and makes the process automatic and robust. We use SEK and Chinese RMB as examples to illustrate the technique. Colour and shape information are used in our system.

(iii) **<u>Motivations and scope:</u>**

It is difficult for people to recognize currencies from different countries. Our aim is to help people solve this problem.

We propose an automated system for currency recognition using Image processing techniques. Our system works for 2 of the most commonly used currencies in our domain.
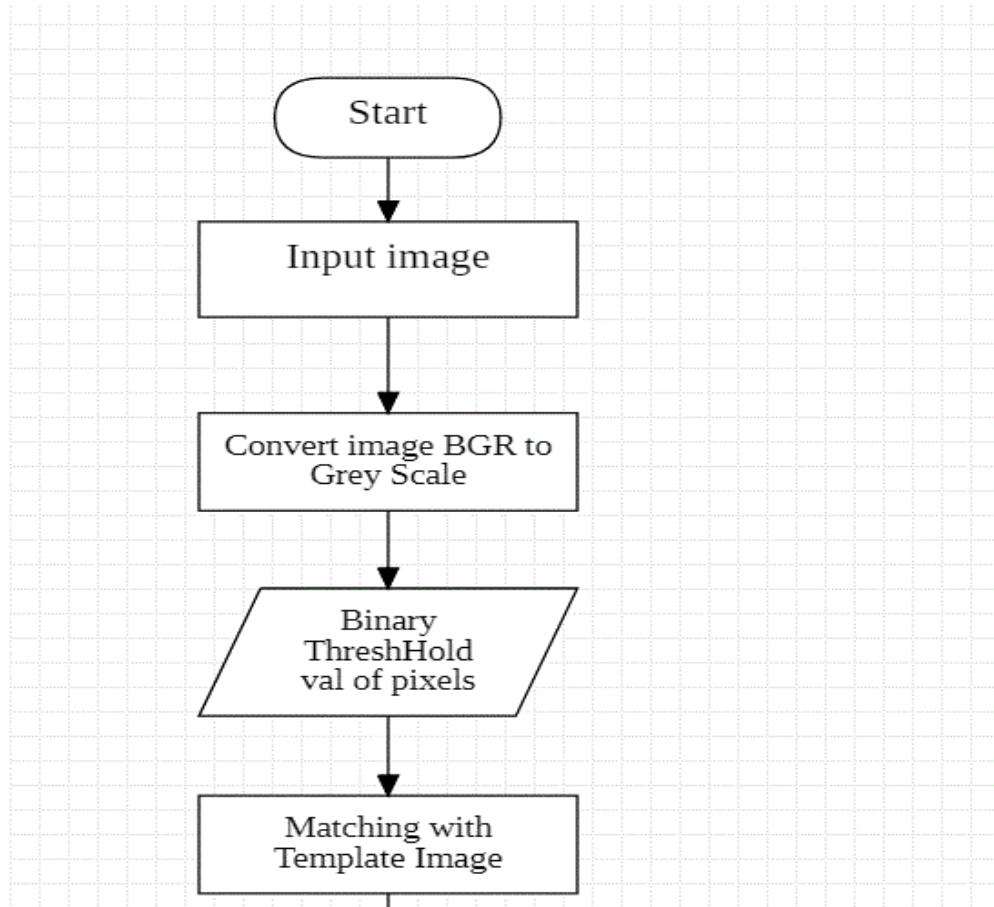
Our project scope is to create a cost effective, handy and lightweight system for currency recognition, which can deliver results with higher accuracy in meantime
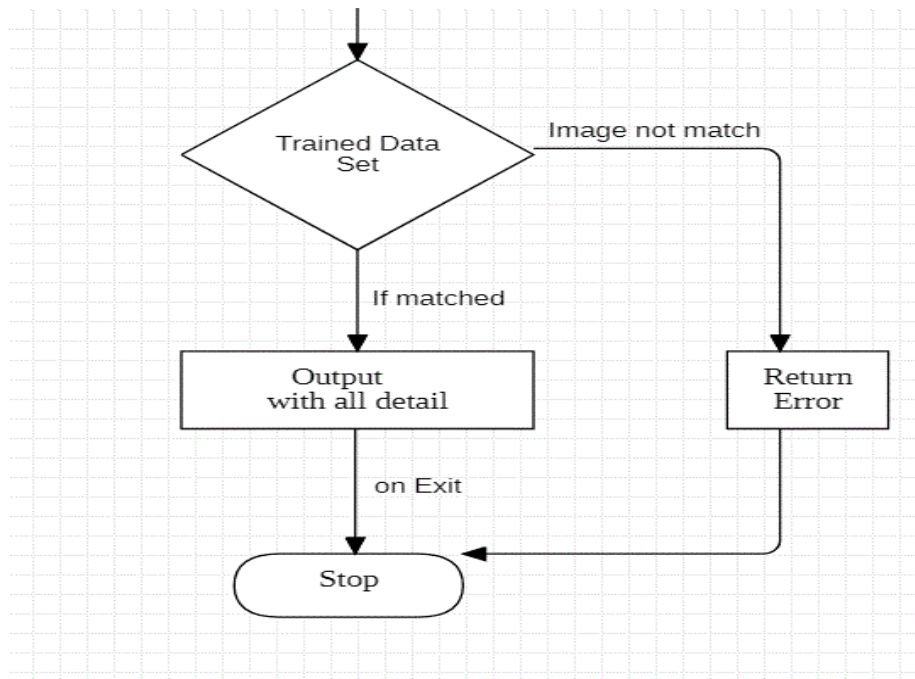
Existing System:

A lot of work has been done in order to recognize currencies automatically, A distinctive point extraction method used a coordinate data extraction method from specific parts of a Euro banknote representing the same colour. In order to recognize banknotes, they used two key properties of banknotes: direction (front, rotated front, back, and rotated back) and face value, neural network based bill recognition and verification method, the learning vector quantization (LVQ) method to recognize Italian Liras, 4 Robust and Effective Component-based method for Banknote Recognition by SURF Features. In another research work, a simple statistical test is used as the verification step, where univariate Gaussian distribution is employed, in another technique for paper currency recognition, three characteristics of paper currencies including size, colour and texture are used in the recognition. After studying the previously used methods for currency recognition, we can see that most of these methods/algorithms use Artificial Neural Networks.

Proposed Model:

Flowchart of proposed model is as follows:

```
                    ┌─────────────┐
                    │    Start     │
                    └──────┬──────┘
                           │
                           ▼
                  ┌─────────────────┐
                  │   Input image    │
                  └────────┬────────┘
                           │
                           ▼
                  ┌─────────────────┐
                  │ Convert image    │
                  │ BGR to Grey Scale│
                  └────────┬────────┘
                           │
                           ▼
                  ┌─────────────────┐
                  │     Binary       │
                  │   ThreshHold     │
                  │  val of pixels   │
                  └────────┬────────┘
                           │
                           ▼
                  ┌─────────────────┐
                  │  Matching with   │
                  │ Template Image   │
                  └─────────────────┘
```

Implementation:

```
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"

},{

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    "value": 1,

    "currency": "Indian Rupee"

},{

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},{

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},{

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},{

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},{

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},{

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  "currency": "Indian Rupee"

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  "value": 20,

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  "currency": "Indian Rupee"

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"currency": "American Dollar"

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"currency": "American Dollar"

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"value": 100,

"currency": "American Dollar"

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"value": 100,

"currency": "American Dollar"

},{

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"value": 1,

"currency": "American Dollar"

},{

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      {"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,
```

```python
        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"]
```

```python
                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'] )

                currvalue = currencydata[int(imageid)]['value']

                currname = currencydata[int(imageid)]['currency']

                curreur = eur_rate * currencydata[int(imageid)]['value']

                currusd = usd_rate * currencydata[int(imageid)]['value']

                window.windows.getind(currvalue, currname, 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']

currname = currencydata[int(imageid)]['currency']

curreur = currencydata[int(imageid)]['value'] * eur_rate

currinr = currencydata[int(imageid)]['value'] * inr_rate

window.windows.getusd(currvalue, currname, curreur, currinr,self)
```
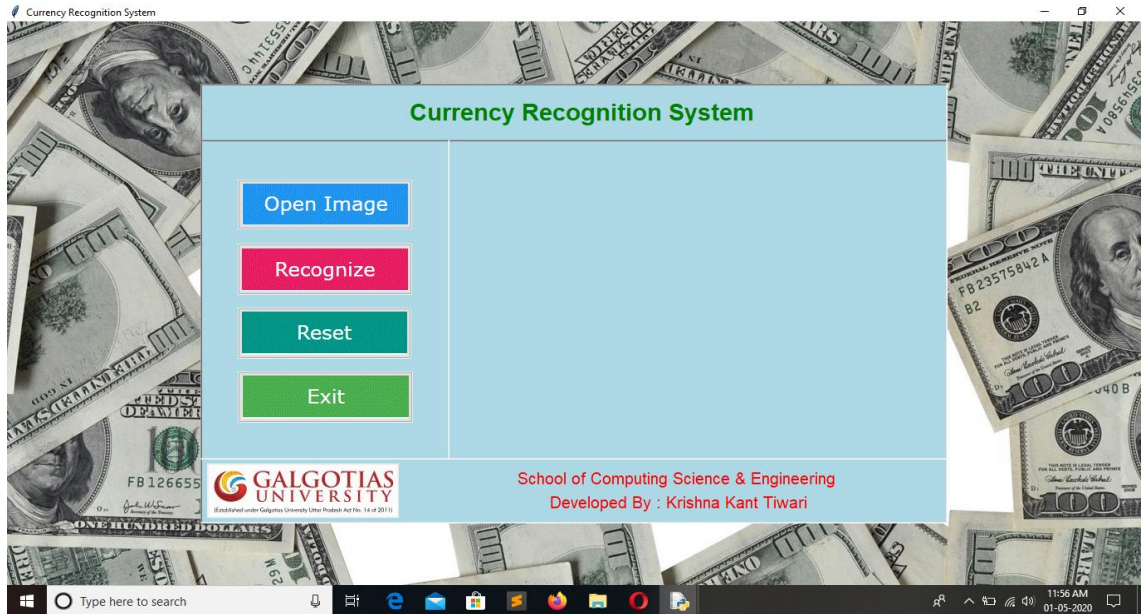
Result:

1. Loading Screen

2. Opening Window

3. Input Image
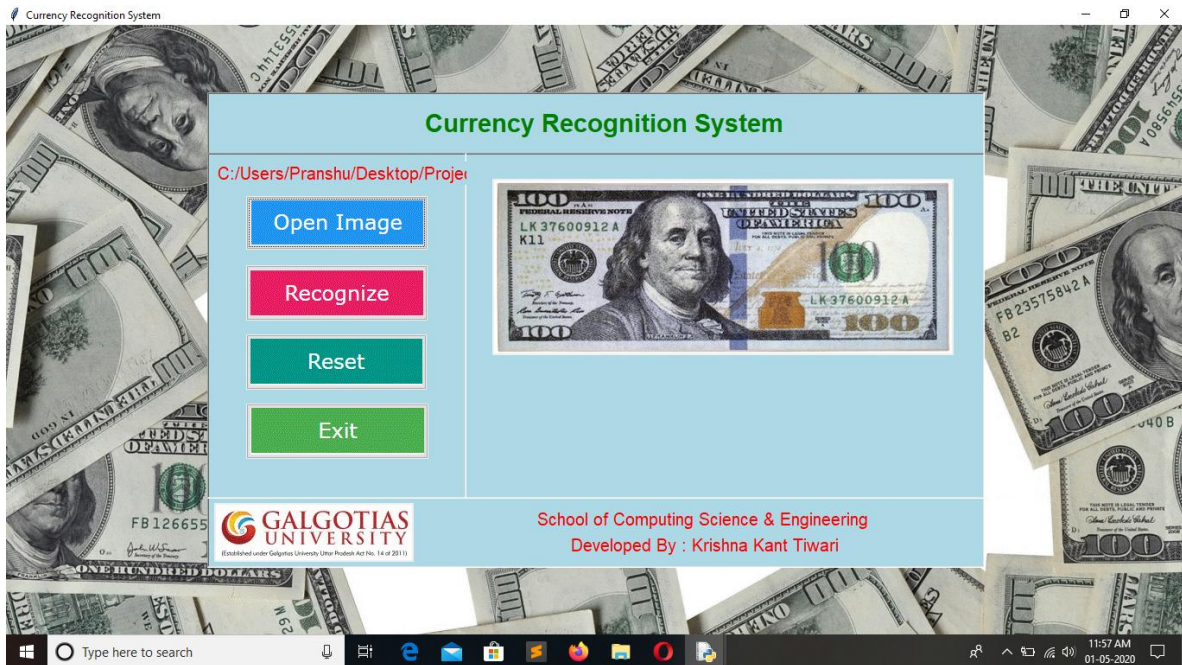
4. Background Processing

5. Output

Discussion:

This paper presents some methods and works to recognize the paper currency which is described by applying image processing. Through the first stage, notice variations among images and this leads to enhance the recognition rate. Basic features are extracted including identification the paper-currency. The procedure begins from data acquisition and later compare between features. The extraction is using open cv and numpy which works well in the whole system with less computation time for segmentation. Assessment of the various approaches is based on classifier accuracy, and correspondence measurements of paper currency.

Conclusion & Future Works:

Currency Recognition is an important application of Pattern Recognition. Many studies have done to recognize paper currencies using Neural Networks. In this paper, method of recognizing currencies has been introduced, which is based on correlation between images. The method is quite reasonable in terms of accuracy. However, there is a room to improve the processing time.

The proposed algorithm is fully automatic and requires no human intervention. The author is also thinking to apply the proposed feature methodology for another model of classification. It might improve the accuracy and efficiency process. This work is in progress as a subsequent work together with the issue of considering multiple currencies with one system.

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