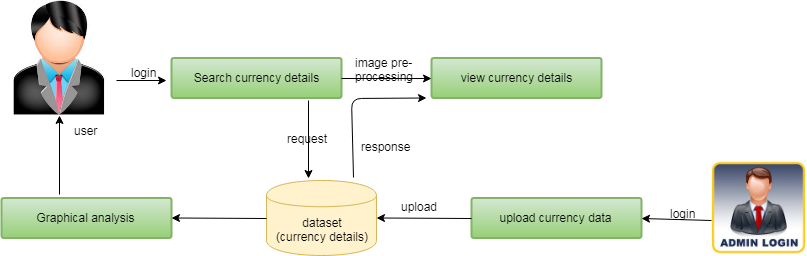
**Currency Recognition System Using Image Processing**

**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 denomination value using characteristics such as size, color, or text on the note, depending on how much the notes within the same country differ. We have considered 20 of the most traded currencies, as well as their denominations. Our system is able to accurately and quickly identify test notes.

**ARCHITECTURE:**

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**EXISTING SYSTEM:**

Around 180+ currencies are available around the world and the need for an automated system related to currencies has been increasing exponentially recently. The need for developing systems that process notes without human intervention for various different uses has been pivotal for the development of systems that help in detecting and recognizing currency notes. However the varying features in each notes and the security aspects involved in different currencies make this task extremely difficult. Various systems have been proposed in the past that take into account different features such as aspect ratio and HSV values . Methods such as pattern matching have been proposed to develop a system that uses a single algorithm for all the currencies. However not a single method has proven to be efficient enough for actual development thereby making this problem statement an interesting area of research. Once the pre-processing steps have been done, we can identify which regions of the note are relatively empty (black pixels in the binary image). This is done based on certain predefined areas. All the currencies are clustered into groups based on which regions of the note are relatively empty. We have chosen to divide them into 3 groups – left side empty, right side empty, and center empty, although if the number of currencies were larger, we could possibly use a larger set of groups (top empty, bottom empty, etc.). Grouping is done by finding out the ratio of black to white pixels for the required region, and then classifying the note based on this ratio. The values chosen to classify the notes have been found experimentally. Note that some notes have no significant empty space, and therefore don’t fall into any of the groups. These notes are classified into another group.

**PROPOSED SYSTEM:**

In this paper, we propose an automated system for currency recognition using Image processing techniques. Our system works for 20 of the most commonly used currencies. One of the first methods proposed to identify the currency notes using image processing techniques was in the early 90’s. However their algorithm does not take aspects of authentication of the notes into account. Thus it has been assumed that the notes are in good condition and images as desired are obtained. It is noteworthy to mention that the system proposed requires the input images to be taken in a predefined angle and distance. The system proposed then applies a series of pre-processing steps on the input images and then extracts certain features such as hue, saturation and value parameters in order to compute a Euclidean distance using these values and compare them with the values that are used as standards. Though this method tries to propose an overall algorithm for all the currencies, it is not an efficient method to identify the notes as certain notes across countries have similar features. The image of the banknote must first be pre-processed to remove any extraneous noise. This is done by applying a simple de-noising filter. The image is then converted to a binary image using adaptive threes holding. Once the banknote has been segregated into one of the predefined groups, we can check the image against templates for each of the countries within that group. Note that this is requires less comparisons than checking the image against all templates of every country in the system, and is the reason we have chosen to segregate the countries into such groups. The templates are chosen such that they are small (thus requiring less computation) but still uniquely identify the country of origin.

**ALGORITHM:**

**K-MEANS CLUSTERING ALGORITHM**

k-means clustering is a method of vector quantization, originally from signal processing, that is popular for cluster analysis in data mining. k-means clustering aims to partition n observations into k clusters in which each observation belongs to the cluster with the nearest mean, serving as a prototype of the cluster. This results in a partitioning of the data space into Voronoi cells. The problem is computationally difficult (NP-hard); however, there are efficient heuristic algorithms that are commonly employed and converge quickly to a local optimum. These are usually similar to the expectation-maximization algorithm for mixtures of Gaussian distributions via an iterative refinement approach employed by both k-means and Gaussian mixture modeling. Additionally, they both use cluster centers to model the data; however, k-means clustering tends to find clusters of comparable spatial extent, while the expectation-maximization mechanism allows clusters to have different shapes. The algorithm has a loose relationship to the k-nearest neighbor classifier, a popular machine learning technique for classification that is often confused with k-means due to the k in the name. One can apply the 1-nearest neighbor classifier on the cluster centers obtained by k-means to classify new data into the existing clusters. This is known as nearest centroid classifier or Rocchio algorithm.

**Image Processing Techniques:**

The basic definition of image processing refers to processing of digital image, i.e removing the noise and any kind of irregularities present in an image using the digital computer. The noise or irregularity may creep into the image either during its formation or during transformation etc. For mathematical analysis, an image may be defined as a twodimensional function f(x,y) where x and y are spatial (plane) coordinates, and the amplitude of f at any pair of coordinates (x, y) is called the intensity or gray level of the image at that point. When x, y, and the intensity values of f are all finite, discrete quantities, we call the image a digital image. It is very important that a digital image is composed of a finite number of elements, each of which has a particular location and value. These elements are called picture elements, image elements, pels, and pixels. Pixel is the most widely used term to denote the elements of a digital image.

**MODULES:**

1. **UPLOAD CURRENCE DATA**

The data can be uploaded by admin without any particular scenario but with the details of currency. The most importantly large amount of can be handled in order to do practically. The data that are handling throughout the project can be done in this module. Users have permission to view data but not edit the data in online they can request the user to get the data.

1. **CLASSIFICATION USING ALGORITHM**

The data can be categorized by the k means clustering algorithm based on the some scenarios. The data can be cluster with various factors in order to get data properly. The k-means clustering algorithm is applied on the large scale data to access the details in perfect manner.

1. **IMAGE PRE-PROCESSING**

It is very important that a digital image is composed of a finite number of elements, each of which has a particular location and value. These elements are called picture elements, image elements, and pixels. Pixel is the most widely used term to denote the elements of a digital image.

1. **GRAPH ANALYSIS**

Data can be analyzed with the help of graphs like pie chart, bar chart or line chart. This will brings the efficiency of the proposed system in which it gives the broad difference in the proposed system. The data driven methods are applied to large data.

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**REQUIREMENT ANALYSIS**

The project involved analyzing the design of few applications so as to make the application more users friendly. To do so, it was really important to keep the navigations from one screen to the other well ordered and at the same time reducing the amount of typing the user needs to do. In order to make the application more accessible, the browser version had to be chosen so that it is compatible with most of the Browsers.

**REQUIREMENT SPECIFICATION**

**Functional Requirements**

* Graphical User interface with the User.

**Software Requirements**

For developing the application the following are the Software Requirements:

1. Python
2. Django
3. Mysql
4. Wampserver

**Operating Systems supported**

1. Windows 7
2. Windows XP
3. Windows 8

**Technologies and Languages used to Develop**

1. Python

**Debugger and Emulator**

* Any Browser (Particularly Chrome)

**Hardware Requirements**

For developing the application the following are the Hardware Requirements:

* Processor: Pentium IV or higher
* RAM: 256 MB
* Space on Hard Disk: minimum 512MB

**CONCLUSION:**

In conclusion, we have designed a system that accurately identifies both the country of origin and the denomination of a given banknote. Our system currently supports twenty of the most common currencies, but can easily be extended to more countries based on the method we have previously described. When compared with the crude algorithm of pixel by pixel comparison, our algorithm is considerably more accurate, and takes less time. We have thus learned that our proposed algorithm is able to identify currency and denomination in an average of 5.3 seconds, which is a considerable improvement over the crude algorithm. However, our proposed system only considers a limited number of currencies. There are 180+ currencies that can be included in the system, and we have chosen to only do for 20 of the most common ones. Also, the system should be effective in identifying notes that are mutilated. Our system is not effective under this consideration. This can be worked on in the future.