Image Segmentation & Recognition

A Minor Project Submitted to

Bachelor of Engineering
(Computer Science and Engineering)

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INTRODUCTION

- Basically Image Segmentation comes under “Computer Vision”. The vision process deals with the identification of discrete objects within an image.
- Image segmentation is defined as a partition of pixels or image blocks into homogeneous groups.
- Image segmentation is used to extract the ROI(Region of Interest) for image analysis.
- The division of an image into meaningful structures, i.e., image segmentation, is often an essential step in image analysis, object representation, visualization, and many other image processing tasks.
- Image Segmentation tools use either color, texture or edge information for carrying out the Segmentation process.
- **Similarity and Discontinuity** are the two mainstays of the Segmentation procedure.
- Image Segmentation is utilized in content-based image retrieval, object tracking in video recordings, clinical applications, and so on.

PROJECT OBJECTIVE & BENEFITS

Project Objective:

- Segmenting the part of Image required
- Pre-Processing the image
- Recognizing the image

Project Benefits:

Image segmentation is used to extract the ROI(Region of Interest) for image analysis.Sometimes it happens that we are not interested in the complete image rather we want just a portion of it. It would be senseless if we process the complete image causing wastage of time, space and money. Image segmentation is functional useful to analyze our image at a much more granular level. The division of an image into meaningful structures, i.e., image segmentation, is often an essential step in image analysis, object representation, visualization, and many other image processing tasks.

EXISTING SYSTEM

Medical images(CT scans, MRI scans) play a vital role in diagnosing the disease. In order to diagnose the disease, medical images must be viewed clearly.

So for clear visual appearance, medical images have been splitted into Region of Interest(RoI) and Non-Region of Interest(RoI) in which RoI must be visualized clearly for diagnosing the disease and to provide preventive measures.

Therefore, to focus only on the RoI which is diagnostically important, segmentation is used.

Image Segmentation is also used in Text-Recognition, Object Recognition, etc.

Various existing Segmentation methods are :

- Edge-Based Segmentation
- Region-Based Segmentation
- Threshold-Based Segmentation
- Clustering-Based Segmentation

PROPOSED ALGORITHM

We tested various Segmentation methods for getting the Segment then we came up with the best Segmentation algorithm that is Clustering :

Clustering is a method to divide the entire data into several numbers of group, these groups are called "Clusters".It's one of the most popular type is K-Means Clustering.

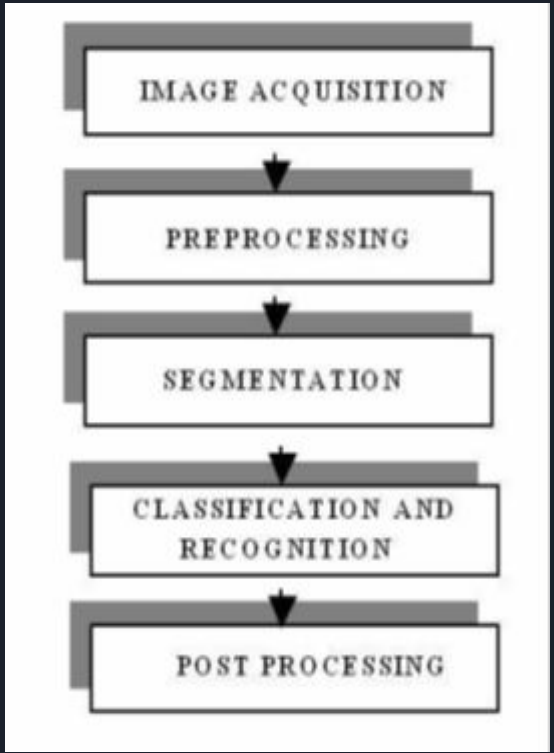
K-Means algorithm is an unsupervised clustering algorithm that classifies the input data points into multiple classes based on their inherent distance from each other.

It classifies a given set of information into k number of disjoint groups. K-means algorithm comprises of two separate stages. In the first stage, it computes the k centroid and in the subsequent stage, it takes each point to the group which has the closest centroid from the particular information point. There are various techniques to define the separation of the closest centroid and one of the most utilized strategies Euclidean separation. When the gathering is done it recalculates the new centroid of each group and based on that centroid, another Euclidean separation is determined between each center and every data point and allocates the cluster in the bunch which has least Euclidean separation.

Euclidean Distance : $d = p(x, y) - c*k$ (where k is number of Clusters)

The new position of Center: $1/k((\sum_{y \in ck} (\sum_{x \in ck}))p(x,y))$

FLOW-DIAGRAM



SOFTWARE & HARDWARE REQUIREMENT

Software Requirement:

- Anaconda Navigator
- Jupyter Notebook
- Python (Fully Loaded)

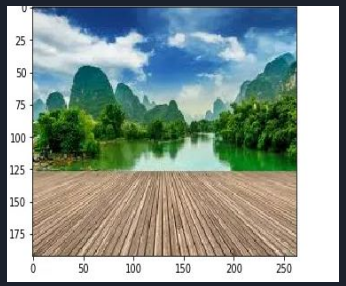
Hardware Requirement:

- System
- Camera

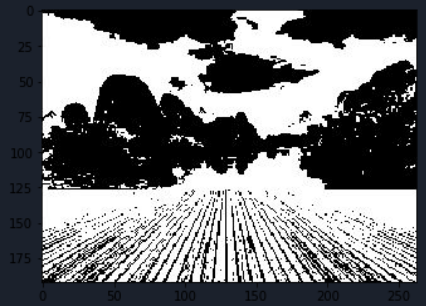
CODE AND SNIPPET OF THE WHOLE PROJECT

OUR FINDINGS

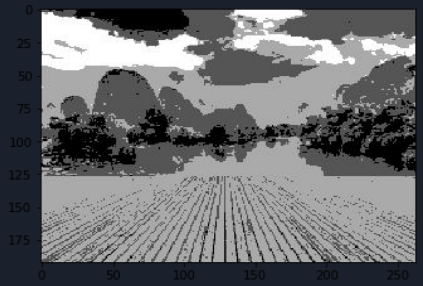
Region Growing Image Segmentation



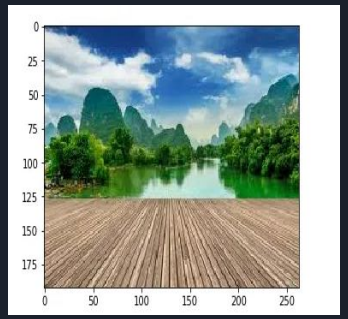
Grey Scaled Image



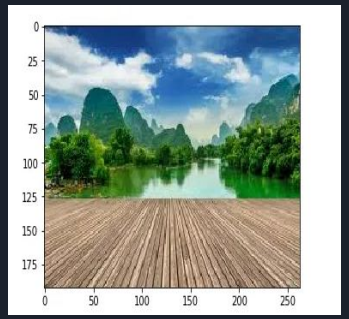
Segmented Image



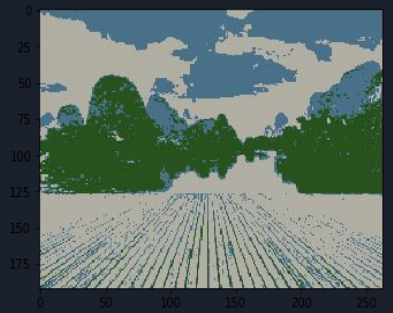
Clustering-Based Image Segmentation:



Segmented Image with k=5



Segmented Image with k=3



APPLICATION - COPY CHECKING

jupyter Image Segmentation Last Checkpoint: 11/07/2019 (unsaved changes)

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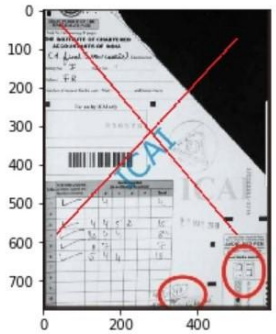
Trusted | Python 3

Run Code

In [42]:
```
pic = plt.imread('download2.jpg')/255  # dividing by 255 to bring the pixel values between 0 and 1
print(pic.shape)
plt.imshow(pic)
```

```
(775, 587, 3)
```

Out[42]: <matplotlib.image.AxesImage at 0x15022ef58d0>



In [43]:
```
pic_n = pic.reshape(pic.shape[0]*pic.shape[1], pic.shape[2])
pic_n.shape
```

Out[43]: (454925, 3)

jupyter Image Segmentation Last Checkpoint: 11/07/2019 (autosaved)

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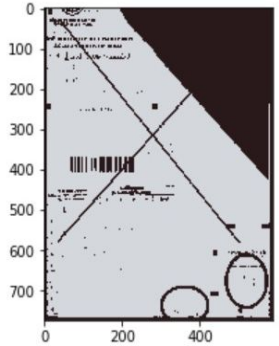
Trusted Python 3

Run Code

In [44]:
```
from sklearn.cluster import KMeans
kmeans = KMeans(n_clusters=2, random_state=0).fit(pic_n)
pic2show = kmeans.cluster_centers_[kmeans.labels_]
```

In [45]:
```
cluster_pic = pic2show.reshape(pic.shape[0], pic.shape[1], pic.shape[2])
plt.imshow(cluster_pic)
```

Out[45]: <matplotlib.image.AxesImage at 0x15022f50048>



In [ ]:

CONCLUSION

Region Growing Image Segmentation:

- One of the greatest advantages of Region Growing is this method performs well when there is high contrast between background and foreground. Its calculation is clear as well as simple.
- But the main disadvantage is sometimes due to the overlapping of grayscale pixel values, it becomes difficult to separate the segments accurately, also the selection of threshold value is very important.

Clustering-Based Image Segmentation:

- Advantages of Clustering are for a small value of k, k-means computation is faster. It produces more accurate results as well as reduces noise in the data.
- But it has some disadvantages too, one among them is, it is very much difficult to predict the value of k accurately as well as it is not suitable for larger datasets.

After examining both the methods we came up with the conclusion that Clustering-Based Segmentation is more better then Region-Growing Image Segmentation since it produces better and accurate segments.


thank you!