Image Segmentation using K-Means Clustering

Submitted in partial fulfilment of the requirements for the award of degree of

BACHELOR OF ENGINEERING IN COMPUTER SCIENCE & ENGINEERING

Under The Supervision of : Mr. Vivek Anand M.

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SCHOOL OF COMPUTING SCIENCE AND ENGINEERING DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERINGGALGOTIAS UNIVERSITY, GREATER NOIDA
INDIA MONTH, YEAR

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CANDIDATE'S DECLARATION

I/We hereby certify that the work which is being presented in the thesis/project/dissertation, entitled **"Image Segmentation using K-Means Clustering"** in partial fulfillment of the requirements for the award of the B. tech submitted in the School of Computing Science and Engineering of Galgotias University, Greater Noida, is an original work carried out during the period of September 2021 to December 2021, under the supervision of Dr. A. Suresh Kumar, Assistant Professor, Department of Computer Science and Engineering/Computer Application and Information and Science, of School of Computing Science and Engineering , Galgotias University, Greater Noida.

The matter presented in the thesis/project/dissertation has not been submitted by me/us for the award of any other degreeof this or any other places.

Divyaranjan Pradhan/18SCSE1180003
Mehul Gaur/ 18SCSE1050026

This is to certify that the above statement made by the candidates is correct to the bestof my knowledge.

Mr. Vivek Anand M.
Assistant Professor

CERTIFICATE

The Final Thesis/Project/ Dissertation Viva-Voce examination of Divyaranjan Pradhan / 18SCSE1180003 and Mehul Gaur / 18SCSE1050026 has been held on _____ and his/her work is recommended for the award of B. tech in Computer Science & Engineering.

Signature of Examiner(s) **Signature of Supervisor(s)**

Signature of Project Coordinator **Signature of Dean**

Date: December, 2021
Place: Greater Noida

Acknowledgement

We take this opportunity to express our sincere gratitude to **Mr. Vivek Anand M., Assistant Professor**, Department of CSE **GALGOTIAS UNIVERSITY**, GREATER NOIDA. Deep Knowledge & keen interest of our supervisor in the field of "*Unsupervised Machine Learning*" to carry out this project. His endless patience, scholarly guidance, strong motivation, continual encouragement, constant and energetic supervision, constructive criticism, valuable advice, reading many inferior drafts and correcting them at all stage have made it possible to complete this project.

We would like to express our heartiest gratitude other faculty member and the staff of CSEdepartment of GALGOTIAS UNIVERSITY, GREATER NOIDA to finish our project.

We would like to thank our entire course mate in GALGOTIAS UNIVERSITY, GREATERNOIDA, who took part in this discuss while completing the course work.

Abstract

The classification of an image into different categories is known as image segmentation. Image segmentation using clustering has been the subject of numerous studies. There are various techniques, with the k-means clustering algorithm being one of the most common. The unsupervised K -means clustering algorithm is used to separate the interest area from the background.

The Project is based on the domain of Machine Learning. The Unsupervised Learning approach is used here. K-Means Clustering algorithm, which is one of the most popular unsupervised algorithm is used here for the classification of images into different categories. The tools which are required to complete this project are: Python Language is used for the Project, Jupyter as a platform is used here for the project implementation.

We used different types of medical images for the analysis. In medical image analysis, mostly the infected areas or area of interest are segmented from background. We used infected blood cell like malaria infected blood cell for the analysis.

We used the k-clustering technique to segment an image. In the future, we can use the morphological operation to increase the quality of the output image and obtain better performance measurement. We can also use the subtractive clustering technique to implement other clustering methods. Finally, we may apply and assess image segmentation in a variety of settings.

List of Acronyms used:

1. ML: Machine Learning

2. KMC: K-Means Clustering

3. I/P : Input

4. O/P : Output

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List of Table

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Introduction

In a decision-oriented application, **Image segmentation** is one of the most commonly used methods for correctly classifying the pixels of an image. It separates a picture into a number of distinct sections with high similarity between pixels in each sector and high contrast between them. It's useful in a variety of fields, including health care, image processing, traffic imaging, and pattern identification. Image segmentation approaches include threshold-based, edge-based, cluster-based, and neural network-based1. Clustering is one of the most efficient strategies among the various techniques. Again there are different types of clustering: ***K*** **-means clustering, Fuzzy *C*-means clustering, mountain clustering method** and **subtractive clustering method.**

K-means clustering is a popular clustering algorithm. It is easier to use and faster to compute than hierarchical clustering. It can also be used with a big number of variables. However, it generates varied cluster results depending on the number of clusters. As a result, the necessary number of clusters, k2, must be initialized. The k number of centroid must be initialized once again. A different initial centroid value would result in a different cluster. As a result, choosing the right initial centroid is crucial.

Image segmentation has become a popular tool in the medical field, where it is used to isolate a region of interest from a background image. As a result, medical images are segmented using various techniques, and the process outputs are used for further medical analysis.

1.2 Tools and Technology Used:

1. **K-Means Clustering:** Clustering is a technique for dividing a set of data into a set of groups. The k-means clustering method is one of the most often used. The k-means clustering algorithm divides a collection of data into k number groups. It divides a given set of information into k distinct clusters. The K-means algo is divided into two parts. It determines the k centroid in the first phase and then moves each point to the cluster with the closest centroid to the data point in the second phase. The Euclidean distance is one of the most widely used methods for determining the distance to the nearest centroid.

   Once the grouping is complete, it recalculates the new centroid of each cluster, calculates a new Euclidean distance between each center and each data point based on that centroid, and allocates the points in the cluster with the shortest Euclidean distance. The member objects and centroid of each cluster in the partition define it. The centroid of each cluster is the place at which the sum of the distances between all of the items in the cluster is the smallest. So, over all clusters, K-means is an iterative algorithm that minimizes the sum of distances between each item and its cluster centroid.

2. **Unsupervised Machine Learning:** Unsupervised learning, also known as unsupervised ML, analyzes and clusters unlabeled datasets using machine learning techniques. Without the need for human intervention, these algorithms uncover hidden patterns or data groupings. It is the best solution for exploratory data analysis, cross-selling techniques, consumer segmentation, and image identification because of its capacity to detect similarities and differences in information.

3. **Python:** Python is an interpreted, object-oriented, high-level programming language with dynamic semantics. Its high-level built in data structures, combined with dynamic typing and dynamic binding, make it very attractive for Rapid Application Development, as well as for use as a scripting or glue language to connect existing components together. Python's simple, easy to learn syntax emphasizes readability and therefore reduces the cost of program maintenance. Python supports modules and packages, which encourages program modularity and code reuse. The Python interpreter and the extensive standard library are available in source or binary form without charge for all major platforms, and can be freely distributed.

4. **Jupyter Notebook:** JupyterLab is a web-based interactive development environment for notebooks, code, and data. Its flexible interface allows users to configure and arrange workflows in data science, scientific computing, computational journalism, and machine learning. A modular design allows for extensions that expand and enrich functionality.

5. **Machine Learning:** Machine learning is an application of artificial intelligence (AI) that provides systems the ability to automatically learn and improve from experience without being explicitly programmed. Machine learning focuses on the development of computer programs that can access data and use it to learn for themselves.

   The process of learning begins with observations or data, such as examples, direct experience, or instruction, in order to look for patterns in data and make better decisions in the future based on the examples that we provide. The primary aim is to allow the computers learn automatically without human intervention or assistance and adjust actions accordingly.

1.3 Applications of Image Segmentation

Some of the practical applications of image segmentation are:

- Content-based image retrieval
- Machine vision
- Medical imaging, including volume rendered images from computed tomography and magnetic resonance imaging.
  - Locate tumors and other pathologies
  - Measure tissue volumes
  - Diagnosis, study of anatomical structure
  - Surgery planning
  - Virtual surgery simulation
  - Intra-surgery navigation
- Object detection
  - Pedestrian detection
  - Face detection
  - Brake light detection
  - Locate objects in satellite images (roads, forests, crops, etc.)

- Recognition Tasks
  - Face recognition
  - Fingerprint recognition
  - Iris recognition

- Traffic control systems
- Video surveillance
- Video object co-segmentation and action localization

Literature Survey

1. **N Dhanachandra, K Manglem, YJ Chanu: "Image segmentation using K-means clustering algorithm and subtractive clustering algorithm"**
   Image segmentation is the classification of an image into different groups. Many researches have been done in the area of image segmentation using clustering. There are different methods and one of the most popular methods is k-means clustering algorithm. K -means clustering algorithm is an unsupervised algorithm and it is used to segment the interest area from the background. But before applying K -means algorithm, first partial stretching enhancement is applied to the image to improve the quality of the image.

2. **S Tatiraju, A Mehta : "Image Segmentation using k-means clustering, EM and Normalized Cuts"**
   This project addresses the problem of segmenting an image into different regions. We analyze two unsupervised learning algorithms namely the K-means and EM and compare it with a graph based algorithm, the Normalized Cut algorithm. The K-means and EM are clustering algorithms, which partition a data set into clusters according to some defined distance measure. The Normalized Cut criterion takes a measure of the similarity between data elements of a group and the dissimilarity between different groups for segmenting the images.

3. **P Panwar, G Gopal, R Kumar : "Image Segmentation using K-means clustering and Thresholding"** –
   Image segmentation is the division or separation of an image into regions ie set of pixels, pixels in a region are similar according to some criterion such as colour, intensity or texture. This paper compares the colorbased segmentation with k-means clustering and thresholding functions. The k-means used partition cluster method. The k-means clustering algorithm is used to partition an image into k clusters. K-means clustering and thresholding are used in this research for the comparison.

4. **V Jumb, M Sohani, A Shrivas : "Color image segmentation using K-means clustering and Otsu's adaptive thresholding"**
   In this paper, an approach for color image segmentation is presented. In this method foreground objects are distinguished clearly from the background. As the HSV color space is similar to the way human eyes perceive color, hence in this method, first RGB image is converted to HSV (Hue, Saturation, Value) color model and V (Value) channel is extracted, as Value corresponds directly to the concept of intensity/brightness in the color basics section.

Description of Modules

For the Image Segmentation Project, we will be using the python library modules such as **cv2**, **matplotlib, numpy** and **sklearn** though which we will import different functions for computing the model. We'll execute this project in **Jupyter Notebook**.

1. **Cv2:** OpenCV (Open Source Computer Vision Library) is an open source computer vision and machine learning software library. OpenCV was built to provide a common infrastructure for computer vision applications and to accelerate the use of machine perception in the commercial products.

2. **Matplotlib:** matplotlib.pyplot is a collection of functions that make matplotlib work like MATLAB. Each pyplot function makes some change to a figure: e.g., creates a figure, creates a plotting area in a figure, plots some lines in a plotting area, decorates the plot with labels, etc.

3. **Sklearn:** Scikit-learn is probably the most useful library for machine learning in Python. The sklearn library contains a lot of efficient tools for machine learning and statistical modeling including classification, regression, clustering and dimensionality reduction.

4. **Numpy:** NumPy is a library for the Python programming language, adding support for large, multi-dimensional arrays and matrices, along with a large collection of high-level mathematical functions to operate on these arrays.

5. **Jupyter notebook:** The Jupyter Notebook is an open-source web application that allows you to create and share documents that contain live code, equations, visualizations and narrative text. Uses include: data cleaning and transformation, numerical simulation, statistical modeling, data visualization, machine learning, and much more.

Terms

- **Machine Learning:**

  - Machine learning is an application of artificial intelligence (AI) that provides systems the ability to automatically learn and improve from experience without being explicitly programmed. Machine learning focuses on the development of computer programs that can access data and use it to learn for themselves.

    The process of learning begins with observations or data, such as examples, direct experience, or instruction, in order to look for patterns in data and make better decisions in the future based on the examples that we provide. The primary aim is to allow the computers learn automatically without human intervention or assistance and adjust actions accordingly.

    But, using the classic algorithms of machine learning, text is considered as a sequence of keywords; instead, an approach based on semantic analysis mimics the human ability to understand the meaning of a text.

- **Unsupervised Learning:**

  - Unsupervised learning cannot be directly applied to a regression or classification problem because unlike supervised learning, we have the input data but no corresponding output data. The goal of unsupervised learning is to find the underlying structure of dataset, group that data according to similarities, and represent that dataset in a compressed format.

    Unsupervised learning cannot be directly applied to a regression or classification problem because unlike supervised learning, we have the input data but no corresponding output data. The goal of unsupervised learning is to find the underlying structure of dataset, group that data according to similarities, and represent that dataset in a compressed format.

- **Clustering:**

  - Clustering is the task of dividing the population or data points into a number of groups such that data points in the same groups are more similar to other data points in the same group and dissimilar to the data points in other groups. It is basically a collection of objects on the basis of similarity and dissimilarity between them.

    Clustering is very much important as it determines the intrinsic grouping among the unlabelled data present. There are no criteria for good clustering. It depends on the user, what is the criteria they may use which satisfy their need. For instance, we could be interested in finding representatives for homogeneous groups (data reduction), in finding "natural clusters" and describe their unknown properties ("natural" data types), in finding useful and suitable groupings ("useful" data classes) or in finding unusual data objects (outlier detection).

    This algorithm must make some assumptions that constitute the similarity of points and each assumption make different and equally valid clusters.

- **K-Means Clustering:**

  - K-Means Clustering is an Unsupervised Learning algorithm, which groups the unlabeled dataset into different clusters. Here K defines the number of pre-defined clusters that need to be created in the process, as if K=2, there will be two clusters, and for K=3, there will be three clusters, and so on.

    It allows us to cluster the data into different groups and a convenient way to discover the categories of groups in the unlabeled dataset on its own without the need for any training.

- **Image Segmentation:**

  - In digital image processing and computer vision, image segmentation is the process of partitioning a digital image into multiple segments (sets of pixels, also known as image objects). The goal of segmentation is to simplify and/or change the representation of an image into something that is more meaningful and easier to analyze.

    Image segmentation is typically used to locate objects and boundaries (lines, curves, etc.) in images. More precisely, image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain characteristics.

Project Design

4.1 UML Diagram

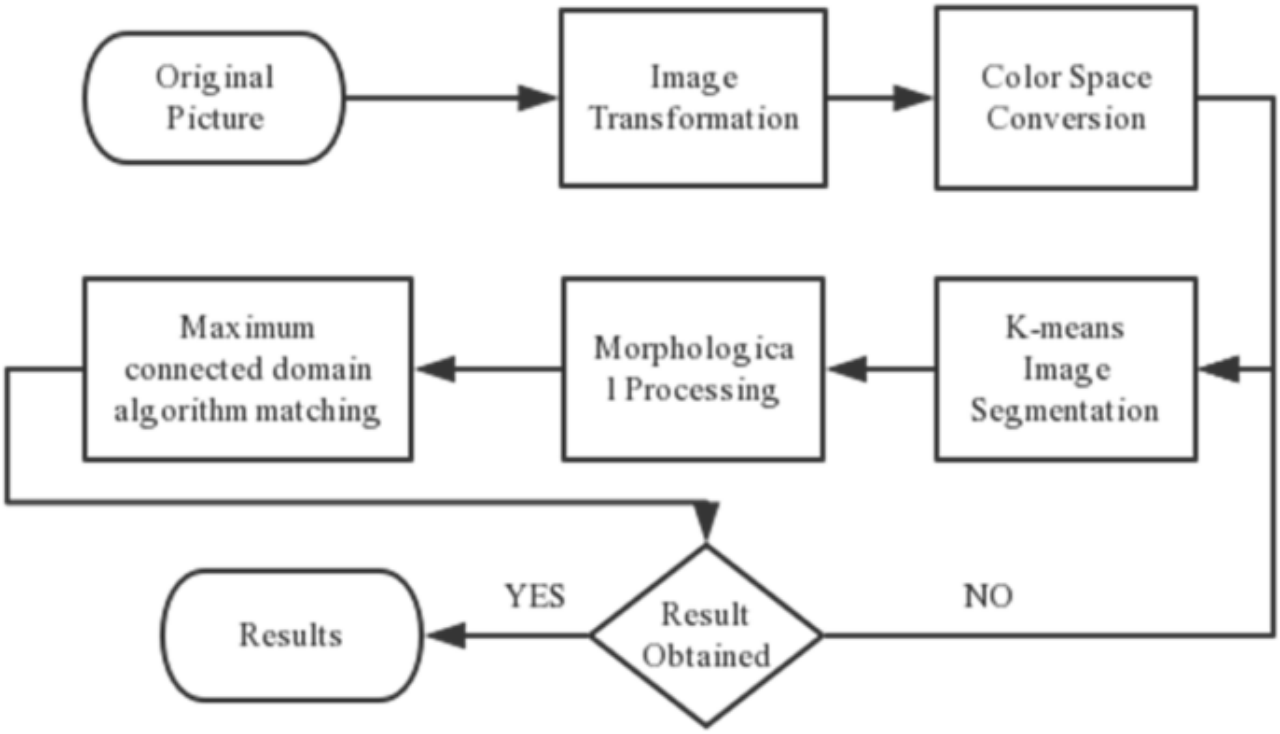


Image preprocessing

Before the formal processing of the image, we will first perform some necessary preprocessing on the image to meet the requirements of the subsequent steps and achieve faster and better segmentation.

Morphological treatment

As we observed, many dark (bright) areas of the target object are below (above) the selected threshold and therefore are misclassified. For this, additional morphological processing must be implemented.

Maximum connected domain algorithm matching

Using the maximum connected domain algorithm, we successively match the original image and sequentially segment all the target object images. The processing result.

4.2 Working:

The working of the project is divided in 4 major steps:
A) Image Transformation
B) Color Space Conversion
C) K-Means Image Segmentation
D) New Segmented Image

A) Image Processing:

Transformation is a function. A function that maps one set to another set after performing some operations.

A function or operator that takes an image as its input and produces an image as its output.

Fourier transforms, principal component analysis (also called Karhunen-Loeve analysis), and various spatial filters, are examples of frequently used image transformation procedures.

Purpose of Image processing:
The main purpose of the DIP is divided into following 5 groups:

Visualization: The objects which are not visible, they are observed.

Image sharpening and restoration: It is used for better image resolution.

Image retrieval: An image of interest can be seen

Measurement of pattern: In an image, all the objects are measured.

Image Recognition: Each object in an image can be distinguished.

B) Color Space Conversion:

We are using computers very much nowadays. Thus, we can see colors in images and diagrams on the computer screen? Those colors are determined on our screen and in print through the use of a color space.

Moreover, color space means the use of a specific color model or system which turns colors into numbers. Further, each color model is a method of creating many colors from a group of primary colors.

Similarly, each model has a range of colors that it can produce. Therefore, this range is the color space. Also, color spaces in different systems aren't exactly the same.

Color space conversion is the translation of the representation of a color from one basis to another. This typically occurs in the context of converting an image that is represented in one color space to another color space, the goal being to make the translated image look as similar as possible to the original.

C) K-Means Image Segmentation:

K-Means Clustering is an Unsupervised Learning algorithm, which groups the unlabeled dataset into different clusters. Here K defines the number of pre-defined clusters that need to be created in the process, as if K=2, there will be two clusters, and for K=3, there will be three clusters, and so on.

It allows us to cluster the data into different groups and a convenient way to discover the categories of groups in the unlabeled dataset on its own without the need for any training.

It is a centroid-based algorithm, where each cluster is associated with a centroid. The main aim of this algorithm is to minimize the sum of distances between the data point and their corresponding clusters.

The k-means clustering algorithm mainly performs two tasks:

- Determines the best value for K center points or centroids by an iterative process.
- Assigns each data point to its closest k-center. Those data points which are near to the particular k-center, create a cluster.

D) New Segmented Image:

As you can see with an increase in the value of k, the image becomes clearer and distinct because the K-means algorithm can classify more classes/cluster of colors.

K-means clustering works well when we have a small dataset. It can segment objects in images and also give better results. But when it is applied on large datasets (more number of images), it looks at all the samples in one iteration which leads to a lot of time being taken up.

4.2 Project Code:

- **Importing of Libraries:**

1. Cv2: OpenCV (Open Source Computer Vision Library) is an open source computer vision and machine learning software library. OpenCV was built to provide a common infrastructure for computer vision applications and to accelerate the use of machine perception in the commercial products.

2. Numpy: NumPy stands for 'Numerical Python'. It is an open-source Python library used to perform various mathematical and scientific tasks. It contains multi-dimensional arrays and matrices, along with many high-level mathematical functions that operate on these arrays and matrices.

3. Matplotlib: Matplotlib is an open-source plotting library in Python introduced in the year 2003. ... It consists of several plots like the Line Plot, Bar Plot, Scatter Plot, Histogram e.t.c through which we can visualise various types of data.

Dominant Color Extraction for Image Segmentation

- Segmentation partitions an image into region having similar visual appearance corresponding to parts of objects.
- We will try to extract the most dominant 'K' colors using K-Means.
- We can apply K-Means with each pixel will reassigned to the closest of the K colors, leading to segmentation.

In [56]:
```
import cv2
```

In [57]:
```
import numpy as np
```

In [58]:
```
import matplotlib.pyplot as plt
```

In [59]:
```
im = cv2.imread('kids1.jpg')
im = cv2.cvtColor(im, cv2.COLOR_BGR2RGB)
original_shape = im.shape
print(im.shape)
```

```
(667, 1000, 3)
```

- # Importing K-Means and Display of Image:

  The k-means problem is solved using either Lloyd's or Elkan's algorithm.

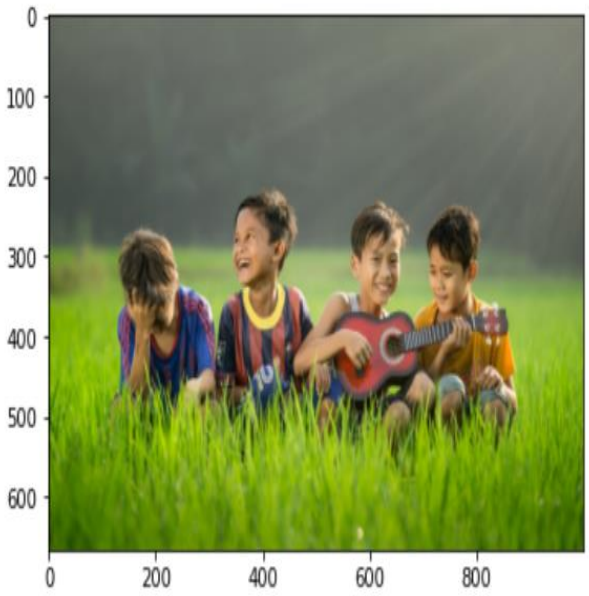
  The average complexity is given by O(k n T), where n is the number of samples and T is the number of iteration.

  The worst case complexity is given by O(n^(k+2/p)) with n = n_samples, p = n_features. (D. Arthur and S. Vassilvitskii, 'How slow is the k-means method?' SoCG2006)

  In practice, the k-means algorithm is very fast (one of the fastest clustering algorithms available), but it falls in local minima. That's why it can be useful to restart it several times.

  If the algorithm stops before fully converging (because of `tol` or `max_iter`), `labels_` and `cluster_centers_` will not be consistent, i.e. the `cluster_centers_` will not be the means of the points in each cluster. Also, the estimator will reassign `labels_` after the last iteration to make `labels_` consistent with `predict` on the training set.

In [60]:
```
plt.imshow(im)
plt.show()
```



In [61]:
```
#Flatten each channel of the image
all_pixels = im.reshape((-1,3))
print(all_pixels.shape)
```

```
(667000, 3)
```

In [62]:
```
from sklearn.cluster import KMeans
```

- ## Choosing Dominant Colors to extract:

  Clustering is used in much real-world application, one such real-world example of clustering is extracting dominant colors from an image.

  Any image consists of pixels, each pixel represents a dot in an image. A pixel contains three values and each value ranges between 0 to 255, representing the amount of red, green and blue components. The combination of these forms an actual color of the pixel. To find the dominant colors, the concept of the k-means clustering is used. One important use of k-means clustering is to segment satellite images to identify surface features.

  Various colors typically belong to different features, k-means clustering can be used to cluster them into groups which can then be identified into various surfaces like water, vegetation etc.

  Tools to find dominant colors:

  matplotlib.image.imread –
  It converts JPEG image into a matrix which contains RGB values of each pixel.

  matplotlib.pyplot.imshow –
  This method would display colors of the cluster centers after k-means clustering performed on RGB values.

In [63]:
```
dominant_colors = 4
km = KMeans(n_clusters=dominant_colors)
km.fit(all_pixels)
```

Out[63]:
```
KMeans(n_clusters=4)
```

In [64]:
```
centers = km.cluster_centers_
```

In [65]:
```
centers = np.array(centers,dtype='uint8')
```

In [66]:
```
print(centers)
```

```
[[115 157  14]
 [ 61  63  36]
 [176 172 105]
 [108 110  98]]
```

- ## New Image using Dominant colors:

1. **plt.figure():** The purpose of using plt. figure() is to create a figure object. The whole figure is regarded as the figure object. It is necessary to explicitly use plt. figure() when we want to tweak the size of the figure and when we want to add multiple Axes objects in a single figure.

2. **plt.subplot():** pyplot. subplots method provides a way to plot multiple plots on a single figure. Given the number of rows and columns , it returns a tuple (fig , ax), giving a single figure fig with an array of axes ax .

3. **plt.axis():** The plt. axis() method allows you to set the x and y limits with a single call, by passing a list which specifies [xmin, xmax, ymin, ymax].

4. **colors.append():** The colors.append() method takes a single item as an input parameter and adds that to the end of the list. The items inside a list can be numbers, strings, another list, dictionary.

Plot what colors are these ?

In [67]:
```
## It shows the four dominant colors
i = 1
plt.figure(0,figsize=(4,2))

colors = []
for each_col in centers:
    plt.subplot(1,4,i)
    plt.axis("off")
    i+=1

    colors.append(each_col)

    ##color swatch
    a = np.zeros((100,100,3), dtype = 'uint8')
    a[:,:,:] = each_col
    plt.imshow(a)

plt.show()
```

- **Segmenting the Original Image:**

Image segmentation is the process of partitioning a digital image into multiple segments (sets of pixels, also known as image objects). The goal of segmentation is to simplify and/or change the representation of an image into something that is more meaningful and easier to analyze.

Image segmentation is typically used to locate objects and boundaries (lines, curves, etc.) in images. More precisely, image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain characteristics.

The result of image segmentation is a set of segments that collectively cover the entire image, or a set of contours extracted from the image (see edge detection). Each of the pixels in a region are similar with respect to some characteristic or computed property, such as color, intensity, or texture. Adjacent regions are significantly different color respect to the same characteristic(s).

Segmenting our Original Image

In [68]:
```
new_img = np.zeros((1000*667,3), dtype='uint8')
print(new_img.shape)
```

```
(667000, 3)
```

In [69]:
```
colors
```

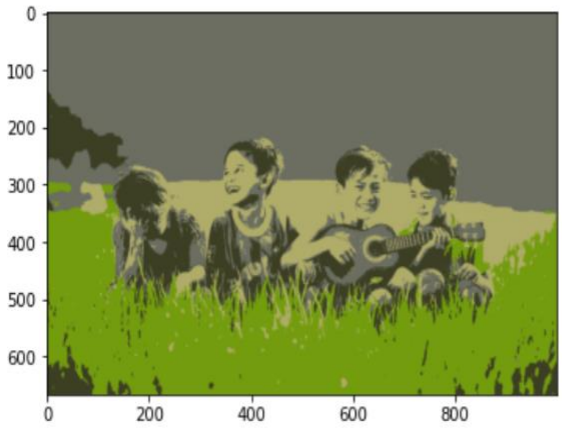
Out[69]:
```
[array([115, 157,  14], dtype=uint8),
 array([61, 63, 36], dtype=uint8),
 array([176, 172, 105], dtype=uint8),
 array([108, 110,  98], dtype=uint8)]
```

In [70]:
```
km.labels_
```

Out[70]:
```
array([3, 3, 3, ..., 1, 1, 1])
```

In [71]:
```
for ix in range(new_img.shape[0]):
    new_img[ix] = colors[km.labels_[ix]]

new_img = new_img.reshape((original_shape))
plt.imshow(new_img)
plt.show()
```



In [ ]:

Result

It is a wonderful project with the understanding of Unsupervised Learning and used the K-Means learning algorithm for the implementation of the project. Dominant Color extraction can be seen in the following results :

Conclusion

In conclusion, there are many challenges related to Image Segmentation in real life, like in the Medical field, to filter out images etc. We certainly did not mention all of them, but we hope that researchers willing to contribute to our research related to Image Segmentation will help to address those other issues as well. In this paper, with the help of the Google Colab/ Jupyter Notebook, we have tried as much as possible to spread awareness of it's use in the medical field. In future, this research can help people to know more about Image Segmentation. It is very easy to understand. This research is upgraded in such a way that it will let you known the details of Segmented image of the original image. This research provides detailed information about the image segmentation process.

References

https://online.codingblocks.com/courses/machine-learning-course-online

https://www.wikipedia.org/

https://www.geeksforgeeks.org/supervised-unsupervised-learning/

Publication/Copyright/Product

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1st International Conference on Paradigm Shifts in Communication, Embedded Systems, Machine Learning and Signal Processing : Submission (10) has been created.

1 message

Microsoft CMT <email@msr-cmt.org> Sun, Dec 19, 2021 at 10:37 PM
Reply-To: Microsoft CMT - Do Not Reply <noreply@msr-cmt.org>
To: divyaranjan_pradhan.scsebtech@galgotiasuniversity.edu.in

Hello,

The following submission has been created.

Track Name: PCEMS22

Paper ID: 10

Paper Title: Image Segmentation using K-Means Clustering

Abstract:
The classification of an image into different categories is known as image segmentation. Image segmentation using clustering has been the subject of numerous studies. There are various techniques, with the k-means clustering algorithm being one of the most common. The unsupervised K - means clustering algorithm is used to separate the interest area from the background.

The Project is based on the domain of Machine Learning. The Unsupervised Learning approach is used here. K-Means Clustering algorithm, which is one of the most popular unsupervised algorithm is used here for the classification of images into different categories. The tools which are required to complete this project are: Python Language is used for the Project, Jupyter as a platform is used here for the project implementation.

We used different types of medical images for the analysis. In medical image analysis, mostly the infected areas or area of interest are segmented from background. We used infected blood cell like malaria infected blood cell for the analysis.

We used the k-clustering technique to segment an image. In the future, we can use the morphological operation to increase the quality of the output image and obtain better performance measurement. We can also use the subtractive clustering technique to implement other clustering methods. Finally, we may apply and assess image segmentation in a variety of settings.

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Thanks,
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