Project 3 CSE 573
Raj Jaysukh Patel
Person number: 50208278
Ubit name: rajjaysu

Image Based Search Engine

Insights of code

The dataset consists 6 images of 5 different locations. Out of which 5 are for dataset and one from each location is for query. The first step is to index images from dataset. It is done by using image descriptor for extracting features from each image and then storing the object as pickle file. The output of an image descriptor is a feature vector. Two feature vectors can be compared using a distance metric to check the similarity between two images.

This search engine searches the images based on given query which is also an image and returns the images in dataset that are similar to the query image. There can be different types of descriptors. The descriptor used in this project is 3D RGB color histogram with 8 bins per channel. Therefore, the images with same color histograms will be considered similar or nearer. OpenCV stores the feature vector as an (8, 8, 8) array. The index is stored in index.cpickle file as a dictionary, the key of the dictionary is the image name, and the value is the computed histogram. This helps in increasing the efficiency while searching because one can directly get the histogram of an image by its name.

Next comes the search. First the code loads the query image and extract the features from the query image by initializing the RGB histogram with same number of bins as in indexing step. Then it loads the cPickle file of index. Then the search begins in each images from the indexed images and comparing it with query image feature vectors. Top 5 images with feature vectors close to query feature vectors are displayed as similar images.

Experiments and Results

The dataset includes images from 5 different locations namely: Alumni Arena, Capen Library, Davis Hall, Lake, and Student Union. Results are as follows:

Result for Alumni Arena:

Number of correct images: 4/5

Result Image

Query Image

Result for Capen Library:

Number of correct images: 5/5

Result Image

Query Image

Result for Davis Hall:

Number of correct images: 3/5

Result Image

Query Image

Result for Lake Lasalle:

Number of correct images: 4/5

Result Image

Query Image

Result for Student Union:

Number of correct images: 4/5

Result Image

Query Image

Overall Accuracy

Overall accuracy = 20/25 = 80%

Improve

Performance of Search engine can be improved in two ways one by improving speed and other by improving accuracy. In order to improve the computation speed, one-step that is already taken is storing the index as a dictionary, which improves the searching efficiency in the search part of the code. Another advantage is that the index is stored as pickle file so that every time you need to perform a search you do not need to go over the image data and calculate its feature vectors.

The descriptor we are using is RGB color histogram, which ignore many other information to search relevant images like texture and shape. We can also consider such information and somehow include them in feature vectors to find which images are nearer or similar. This technique may take more computation time but will give higher accuracy.

Conclusion

The project involves the proper understanding of the coding practice for developing application in python. It also involves the basic concepts of reusing an object in python for improving the speed. Main take away of the project is to learn how to use fundamental techniques like feature matching and RGB histograms to build a practical real world application.