Expt_10

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Aim: To Create Program to perform a retrieving Image and Searching.

Objective:

The fundamental need of any image retrieval model is to search and arrange the images that are in a visual semantic relationship with the query given by the user.

Most of the search engines on the Internet retrieve the images based on text-based approaches that require captions as input.

Theory:

There are several crucial processes involved in developing an image retrieval and search program. Gather and arrange your image dataset first, making sure it is well-structured for access. Then, decide the features such as colour histograms, texture features, or deep learning-based features you want to use to represent images. Create a database to store these features along with pertinent metadata, such as file paths or image descriptions, after extracting them from your dataset. Create a querying system that lets users input a search image and then preprocess it to extract its features.

Use the proper similarity metrics to determine the degree of similarity between the query image's features and those in your database. Find the top k images that are most similar to the search image by ranking the images according to their similarity. Consider developing a user interface, which could be a web app, desktop program, or command-line tool, if you want your system to be user-friendly. Users should see the findings, along with the top k comparable images and associated metadata.

Also use indexing or approximate search methods to optimize your system's performance, especially when working with enormous datasets. Use assessment measures like precision, recall, and F1-score to thoroughly test and assess your system using a variety of query images to confirm its effectiveness. Consider deployment on a web server, as an application, or through an API if you intend to share your solution. Last but not least, practice continuous improvement

by modifying your picture retrieval system in response to user feedback and changing requirements.

Code:

```
import cv2

import numpy as np

import os

from IPython.display import Image, display


def calculate_histogram(image):

    hist = cv2.calcHist([image], [0, 1, 2], None, [8, 8, 8], [0, 256, 0, 256, 0, 256])

    hist = cv2.normalize(hist, hist).flatten()

    return hist

def chi_squared_distance(hist1, hist2):

    return 0.5 * np.sum(((hist1 - hist2) ** 2) / (hist1 + hist2 + 1e-10))

def build_image_database(image_folder):

    image_database = {}

    for image_filename in os.listdir(image_folder):

        image_path = os.path.join(image_folder, image_filename)

        image = cv2.imread(image_path)

        if image is not None:

            hist = calculate_histogram(image)

            image_database[image_filename] = hist

    return image_database
```

```python
def search_similar_images(query_image_path, image_database, top_k=5):

    query_image = cv2.imread(query_image_path)

    query_hist = calculate_histogram(query_image)

    similarities = {}

    for image_filename, hist in image_database.items():

        similarity = chi_squared_distance(query_hist, hist)

        similarities[image_filename] = similarity

        similar_images = sorted(similarities, key=similarities.get)[:top_k]

    return similar_images

image_folder = '/content/sample_data/Dataset'

image_database = build_image_database(image_folder)

query_image_path = '/content/sample_data/Dataset/0001.png'

query_image_path = '/content/sample_data/cat1.jpg'

similar_images = search_similar_images(query_image_path, image_database, top_k=5)

for idx, image_filename in enumerate(similar_images):

    similar_image_path = os.path.join(image_folder, image_filename)

    display(Image(filename=similar_image_path))
```
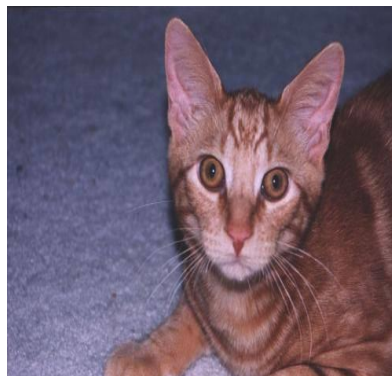
Output:

Input_Image_1

Output_1

Input_Image_2

Output_2

Conclusion:

An image retrieval and search program's main objective is to make it possible for users to locate photos within a dataset that are visually comparable to a query image. This can be done using a variety of methods, such as text-based search, content-based image retrieval (CBIR), or a mix of the two. A colour histogram and basic similarity metrics can be used to create a rudimentary image retrieval and search system.

In this experiment, we successfully implemented program for Retrieving and Searching Image.