Ecole Supérieure Informatique Sidi Bel Abbes

Second Cycle

Computer Vision

LAb -3-: SIFT Feature Extraction for Flower Image Classification

October 19, 2025

1. **Objective:**

   - The objective of this lab is to extract SIFT features from a flower image dataset, split the dataset into training and testing sets, and use the KNN algorithm to classify flowers based on their SIFT features.

2. **Programming Language and Library**

   - Materials:
   - Flower image dataset (containing images of different flower species).
   - Python with OpenCV and scikit-learn libraries.

3. **Lab Procedure:**

   - Data Loading and Preprocessing (15 minutes):
   - Load the image using matplotlib.
   - **SIFT Feature Extraction :** For each image in the dataset:
     - Detect and compute SIFT key points and descriptors,
     - Store the descriptors along with their corresponding class labels.

```python
import numpy as np
import cv2 as cv
img = cv2.imread('images/dolphin.jpg')
crop_img = img[200:, 200:]
gray= cv.cvtColor(img,cv.COLOR_BGR2GRAY)
sift = cv.SIFT_create()
#kp = sift.detect(gray,None)
kp, des = sift.detectAndCompute(gray,None)
img=cv.drawKeypoints(gray,kp,img)
cv.imwrite('sift_keypoints.jpg',img)
plt.imshow(img)
plt.show()
```

   - Dataset Splitting:
     - Split the dataset into a training set and a testing set. A common split ratio is 80% for training and 20% for testing.
     - Ensure that the split maintains a balance of images from different flower species in both sets.
   - K-Nearest Neighbors (KNN) Classifier

- Train the KNN classifier on the training set, using the SIFT descriptors as features and the class labels as targets.
- For each image in the testing set:
  - Extract SIFT features and use the trained KNN classifier to predict the flower's class.
  - Compare the prediction to the actual class label to calculate accuracy.
  - Store the results for evaluation.
- Performance Evaluation:
  - Compute accuracy to evaluate the KNN classifier's performance.
  - Draw and include the confusion matrix in your lab report.

4. **Assignment:** Provide a report on the outcomes.

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