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**EXP NO:** 06
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## SIFT and HOG features for image analysis

**Aim:** Utilization of SIFT and HOG features for image analysis

**Algorithm:**

1. Read image and convert to grayscale.

2. Initialize SIFT/HOG detector (cv2.SIFT_create(), cv2.HOGDescriptor()).

3. Detect keypoints and compute descriptors.

4. Draw keypoints on the image.

5. Display or store the extracted features.

6. Use features for comparison or matching.

**Code:**

```
import cv2

import matplotlib.pyplot as plt

from skimage.feature import hog

from skimage import color


# ----------- SIFT -----------

img = cv2.imread('/content/drive/MyDrive/input.jpg')


# Check if image was loaded successfully

if img is None:

    print("Error: Could not load image from the specified path. Please check the file path and ensure the image exists.")

else:

    gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)
```

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```python
# SIFT detector
sift = cv2.SIFT_create()
keypoints, descriptors = sift.detectAndCompute(gray, None)


# Draw keypoints
sift_img = cv2.drawKeypoints(img, keypoints, None,
flags=cv2.DRAW_MATCHES_FLAGS_DRAW_RICH_KEYPOINTS)


# ----------- HOG -----------
# Convert to grayscale for HOG
gray_hog = color.rgb2gray(cv2.cvtColor(img, cv2.COLOR_BGR2RGB))


# Compute HOG features and visualization
hog_features, hog_img = hog(gray_hog, orientations=9, pixels_per_cell=(8, 8),
                    cells_per_block=(2, 2), visualize=True, channel_axis=None)


# ----------- Display Results -----------
plt.figure(figsize=(10,5))


plt.subplot(1,2,1)
plt.imshow(cv2.cvtColor(sift_img, cv2.COLOR_BGR2RGB))
plt.title("SIFT Features")
plt.axis('off')


plt.subplot(1,2,2)
plt.imshow(hog_img, cmap='gray')
plt.title("HOG Features")
plt.axis('off')
```

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plt.show()

**Output:**



**Result:** Thus, Utilization of SIFT and HOG features for image analysis was implemented successfully.