Shri Vile Parle Kelavani Mandal's
DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING
(Autonomous College Affiliated to the University of Mumbai)
NAAC Accredited with "A" Grade (CGPA : 3.18)

Department of Artificial Intelligence & Machine Learning
Academic Year 2023-2024

Name: Abhay Mathur **SAPID:** 60017210016
Batch: A1

Experiment No. 6

Aim: Object Detection

Objective: Develop a program to detect objects in an Image

Theory:

Object Detection is a computer technology related to computer vision, image processing, and deep learning that deals with detecting instances of objects in images and videos

SIFT stands for Scale-Invariant Feature Transform and was first presented in 2004, by **D.Lowe**, University of British Columbia. SIFT is invariance to image scale and rotation

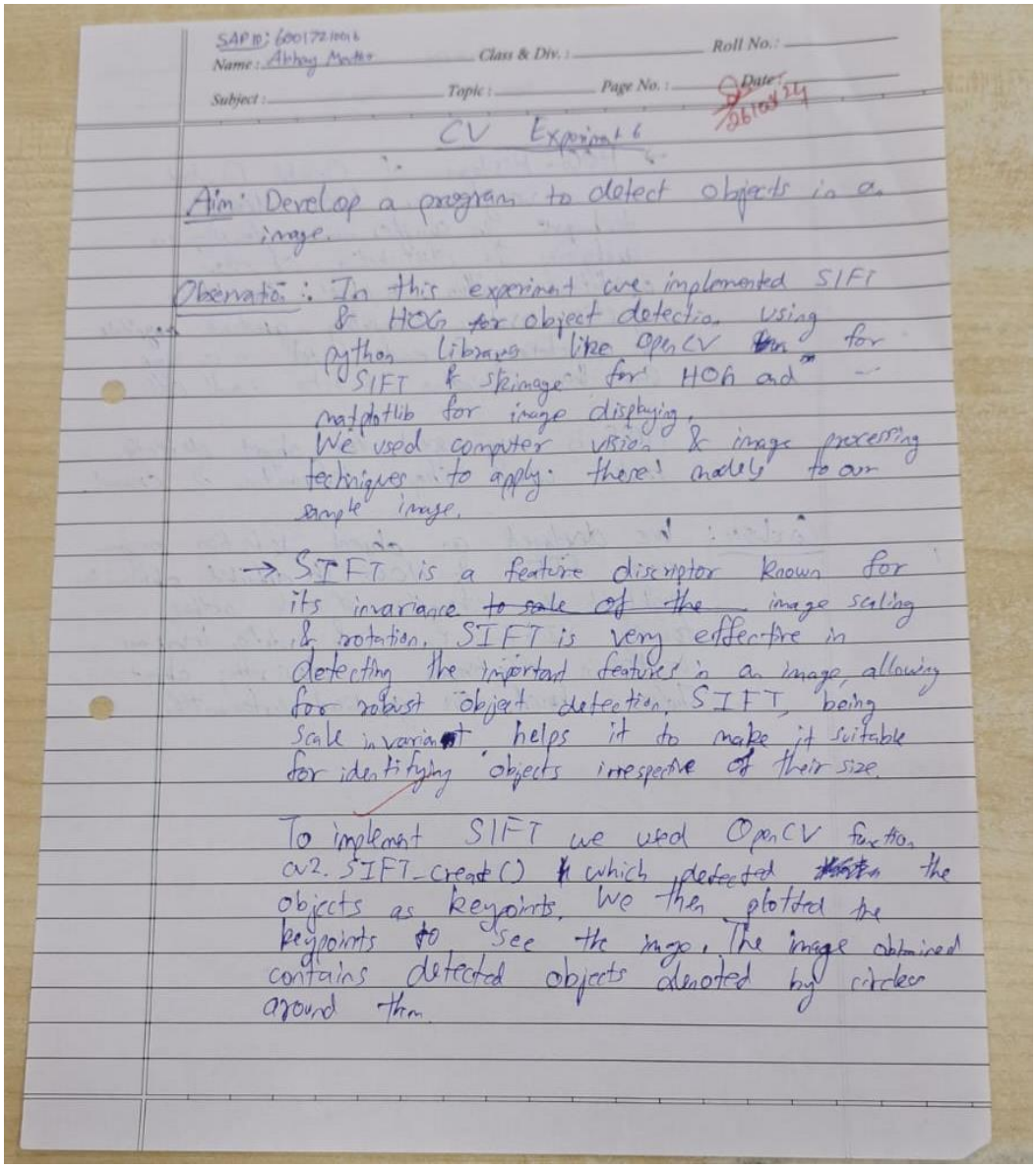
The Histogram of Oriented Gradients (HOG) is a popular feature descriptor technique in computer vision and image processing. It analyzes the distribution of edge orientations within an object to describe its shape and appearance. The HOG method involves computing the gradient magnitude and orientation for each pixel in an image and then dividing the image into small cells.

Problem Definition

- Object Detection in an image using SIFT
- Object Detection in an image using HOG

Observations

Department of Artificial Intelligence & Machine Learning
Academic Year 2023-2024



SAP ID: 60017210016
Name: Abhay Mehta Class & Div.: Roll No.:
Subject: Topic: Page No.: Date: 26/04/24

CV Experiment 6

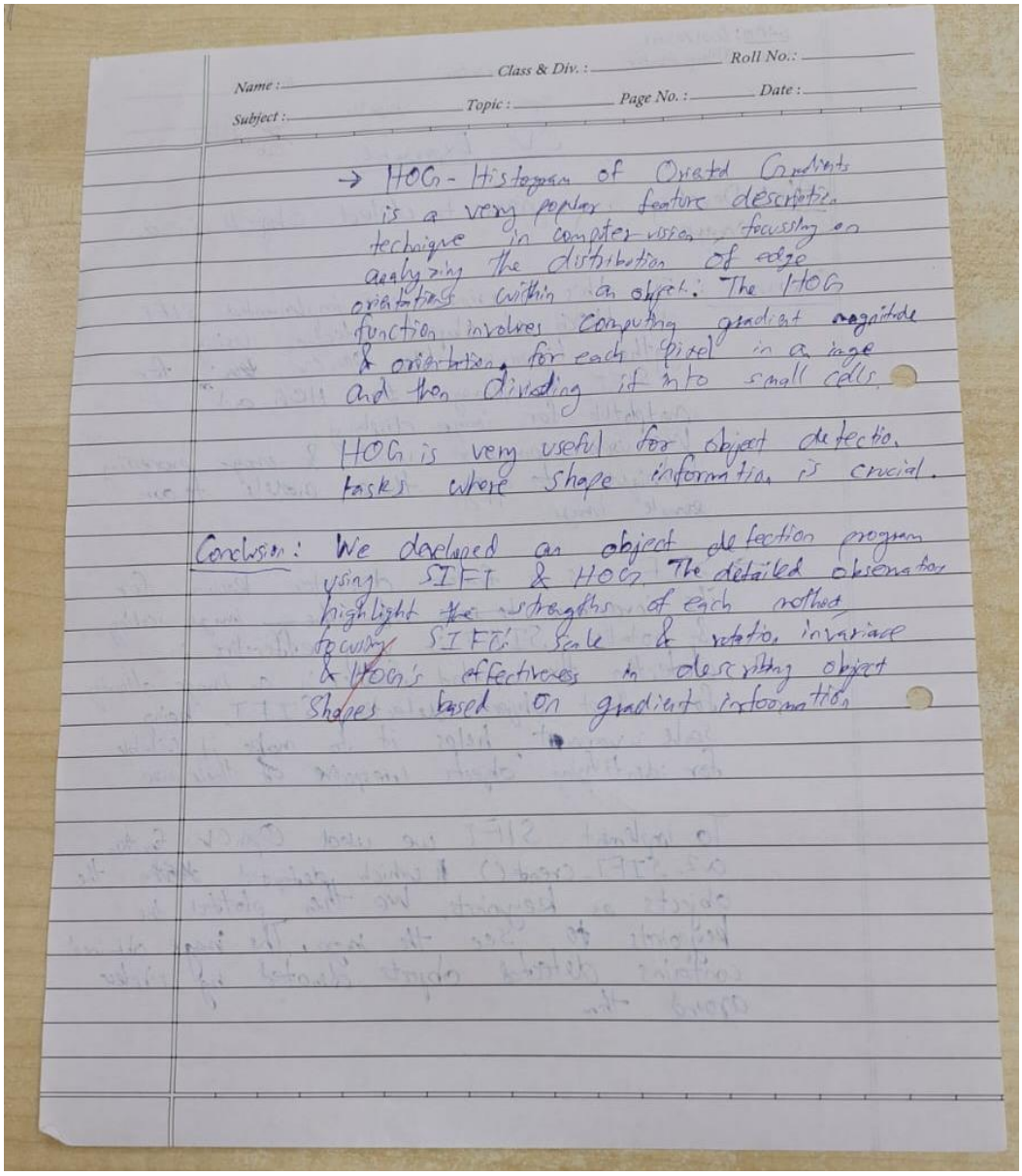
Aim: Develop a program to detect objects in a image.

Observation: In this experiment we implemented SIFT & HOG for object detection using python libraries like OpenCV for SIFT & Skimage for HOG and matplotlib for image displaying. We used computer vision & image processing techniques to apply these models to an sample image.

→ SIFT is a feature descriptor known for its invariance to scale of the image scaling & rotation. SIFT is very effective in detecting the important features in an image, allowing for robust object detection. SIFT, being scale invariant helps it to make it suitable for identifying objects irrespective of their size.

To implement SIFT we used OpenCV function cv2.SIFT_create() which detected the objects as keypoints. We then plotted the keypoints to see the image. The image obtained contains detected objects denoted by circles around them.

Department of Artificial Intelligence & Machine Learning
Academic Year 2023-2024



Name : Class & Div. : Roll No.:
Subject : Topic : Page No. : Date :

→ HOG - Histogram of Oriented Gradients is a very popular feature descriptor technique in computer vision, focussing on analyzing the distribution of edge orientations within an object. The HOG function involves computing gradient magnitude & orientation for each pixel in a image and then dividing it into small cells.

HOG is very useful for object detection tasks where shape information is crucial.

Conclusion: We developed an object detection program using SIFT & HOG. The detailed observations highlight the strengths of each method focusing SIFT's scale & rotation invariance & HOG's effectiveness in describing object shapes based on gradient information