NagarYuwakShikshanSanstha's

YeshwantraoChavanCollegeofEngineering

(AnAutonomousInstitutionaffiliatedtoRashtrasantTukadojiMaharajNagpurUniversity)

HingnaRoad,Wanadongri,Nagpur

-441110NAACA++

DepartmentofComputerTechnology

Vision of the Department

Mission of the Department

Session 2025-2026

Vision: Dreamofwhereyouwant.	Mission: MeanstoachieveVision

Program Educational Objectives of the program(PEO):(broadstatementsthatdescribethe professionalandcareeraccomplishments)

PEO1	Preparation	P: Preparation	Pep-CL abbreviation pronounce as Pep-si-lL easy to recall
PEO2	Core Competence	E: Environment (Learning Environment)	
PEO3	Breadth	P: Professionalism	
PEO4	Professionalism	C: Core Competence	
PEO5	Learning Environment	L: Breadth (Learning in diverse areas)	

Program Outcomes (PO):(statementsthatdescribewhatastudentshouldbeabletodoandknowbytheend of a program)

Keywords of POs:

Engineeringknowledge,Problemanalysis,Design/developmentofsolutions,ConductInvestigationsofComplex Problems, Engineering Tool Usage, The Engineer and The World, Ethics, Individual and Collaborative Team work, Communication, Project Management and Finance, Life-Long Learning

PSO Keywords: Cutting edge technologies, Research

"I am an engineer, and I know how to apply engineering knowledge to investigate, analyse and design solutions to complexproblemsusingtoolsforentireworldfollowingallethicsinacollaborativewaywithpropermanagement skillsthroughoutmylife."

Integrity:I will adhere tothe Laboratory Code of Conduct and ethics inits entirety.

Siddhesh Pitale

03/09/25

Name and Signature of Student and Date

(SignatureandDateinHandwritten)

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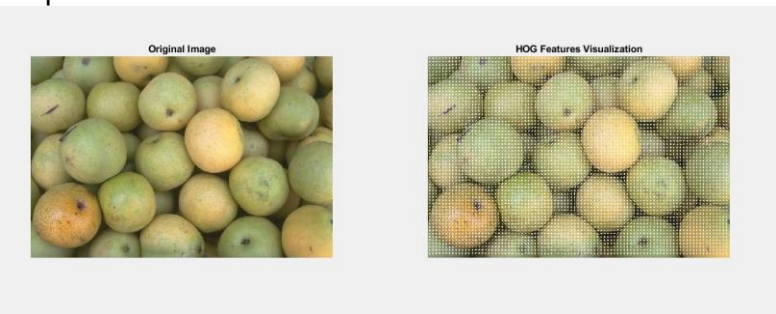
Session	2025-26 (ODD)	Course Name	Computer visionLab
Semester	5	Course Code	23CT1522
Roll No	73	Name of Student	Siddhesh Pitale

PracticalNumber	Practical3
CourseOutcome	Apply image enhancement and smoothing techniques to improve image quality forfurtheranalysis.
Aim	ImplementHistogramofOrientedGradient(HOG)forFeatureextraction
ProblemDefinition	
Theory (100words)	TheHistogramofOrientedGradient(HOG)isafeaturedescriptorused in computer vision for tasks like object detection. It extracts features by analysing the distribution of gradient orientations withinlocalized parts of an image, capturing the structural and textural detailsofanobject.Essentially,HOGfocusesonthe directionand intensityof edges to represent an object's shape and contour, while disregarding elementslikecolor.TheresultingHOGfeaturevectoristypicallyusedto train a machine learning model for object classification. TheHOGprocessinvolvesseveralsteps: 1. **Preprocessing**:The image isoftenconverted tograyscale andresized. 2. **Gradient computation**:The gradient magnitude and direction arecalculatedforeachpixeltohighlightedges. 3. **Divide image into cells**:Theimageisdividedintosmallregions called"cells". 4. **Create orientation histograms**:Foreachcell,ahistogramis generatedtoshowthedistributionofgradientorientations,groupedintobins.Each pixel's gradient magnitude contributes to the relevant bin. 5. **Normalize across blocks**:To improve robustness against lighting changes, cell histograms are normalized within larger, overlapping"blocks."Thehistogramswithineachblockarecombineda ndnormalized. 6. **Concatenate into a final feature vector**:Allthenormalizedblock histogramsareconcatenatedtocreatethefinalHOGdescriptor,representin gtheobject'sshapeandstructure.

Procedureand Execution (100Words)	Algorithm: 1. Start 2. Readinputimage 3. Converttograyscale 4. Computegradientmagnitudeandorientation 5. Divideimageintocells 6. Computeorientationhistogramforeachcell 7. Normalizehistogramswithinblocks 8. Concatenateallfeatures→HOGdescriptor 9. DisplayHOGvisualization 10. Stop

	Code:
	clc;clear
	;closeall;
	img =
	imread('pears.png');if
	size(img, 3) == 3
	grayImg=rgb2gray(img);else
	grayImg=img;end
	[hogFeatures,hogVisualization]=extractHOGFeatures(grayImg,'CellSize',[88],'NumBin
	s', 9);
	figure;subplot(1
	,2,1);imshow(i
	mg);
	title('OriginalImage');
	subplot(1, 2,
	2);imshow(img);
	hold
	on;plot(hogVisualization);
	title('HOGFeaturesVisualization');
	fprintf('SizeofHOGfeaturevector:%d\n',numel(hogFeatures));

	Output: 
OutputAnalysis	TheHOGfeaturevisualizationshowshowgradientsandedgesarecapturedinlocalized cells. The descriptors highlight object shapes and contours while ignoring irrelevant details like color and lighting. This makes HOG highly suitable for applicationssuchaspedestriandetectionandfacerecognition.Theextractedfeature vector can be directly used in classification models (e.g., SVM, neural networks)..
LinkofstudentGithubprofilewherelabassignment has	https://github.com/Siddheshpitale/Computer-Vision-

beenuploaded	
Conclusion	HOG is a powerful feature extraction method that captures edge and gradient information, whichisessentialforobjectrecognitiontasks.Bydividingtheimageintocellsandnormalizingover blocks, HOG achieves robustness against illumination changes. Its effectiveness in capturing shape information makes it widely applicable in computer vision tasks such ashuman detection, facial recognition, and object classification
PlagReport(Similarityindex<12%)	Yes
Date	3-09-2025