Faculty of Eng. & Natural Sci.

EE417-202101

Computer Vision

Instructor

Name	Email	Office	Phone	Web	Office Hours
Mustafa Ünel	munel@sabanciuniv.edu	FENS 1066	9549	http://people.sabanciuniv.edu/munel	Before and after classes, or by appointment.

Course Content

Introduction to Computer Vision, Human Visual System, Image Formation, Pointwise Image Operations, Image Intensity Transformations, Geometric/Coordinate Transforms, Interpolation, Image Neighborhood Operations, Spatial Filtering, Edge Detection, Feature Extraction, Principal Component Analysis and Applications, Morphological Image Processing, Basic Segmentation, Thresholding techniques, Motion/Dynamic Scenes, Color and Texture, Object/Shape Modeling/ Recognition

Objectives

To teach the fundamentals of 3D computer vision, which tries to make computers see and interpret the world around us by constructing 3D models from 2D (or 3D) images.

Recommend or Required Reading

Textbook

Concise Computer Vision: An Introduction into Theory and Algorithms, Springer, Series: Undergraduate Topics in Computer Science, by Reinhard Klette, 2014. ISBN 978-1-4471-6319-0

Optional Readings

Computer Vision: Algorithms and Applications, R. Szeliski, Springer, 2010

Assessment Methods and Criteria

	Percentage (%)	Number of assessment methods
Midterm	30	1
Assignment	35	10
Group Project	35	1

Course Outline

- Introduction
- Pointwise Image Processing, Image Intensity Transformations, Histograms
- Geometric/Coordinate Transforms
- Image Neighborhood Operations, Spatial Filtering
- Edge Detection
- Feature Extraction
- Camera Models and Calibration
- Motion Estimation and Optic Flow
- Stereo Vision
- Structure from Motion
- Object Detection and Recognition

Learning Outcomes

Upon successful completion of EE 417 Computer Vision, students are expected to be able to:

- Discuss the main problems of computer vision, its uses and applications
- Design and implement various image transforms: point-wise transforms, neighborhood operation-based spatial filters, and geometric transforms over images
- Design and implement several feature extraction algorithms including edges and corners
- Design and implement line and circle detection using Hough transform
- Calibrate real cameras and determine both intrinsic and extrinsic parameters,
- Formulate and solve 2D optic flow problem
- Establish correct correspondence for stereo images using a correlation based matching technique
- Estimate the essential/fundamental matrix and determine extrinsic parameters (rotation and translation) of a stereo vision system
- Reconstruct 3D structure from 2D images using estimated extrinsic parameters
- Identify or recognize objects from images

Course Policies

- Cheating is absolutely subject to a disciplinary action and a null grade.
- Make-up only for official excuses.