Faculty of Eng. & Natural Sci.

EE417-202201

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 computer vision which tries to make computers see and interpret the world.

Recommend or Required Reading

Textbook

Concise Computer Vision: An Introduction into Theory and Algorithms, Reinhard Klette, Springer, 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	35	1
Assignment	35	10
Group Project	30	1

Course Outline

- Introduction
- Image Transformations, Pointwise Image Processing, Spatial Filtering
- Image Gradients, Edge Detection
- Line and Circle Detection using Hough Transform
- Corner Detection
- Feature Detectors and Descriptors
- 2D Transformations and Image Warping
- Image Homographies and RANSAC
- Geometric Camera Models and Calibration
- Optical Flow, Tracking
- 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 the 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

Makeup only for official excuses