



Computer Engineering Department
Giza, 12613 EGYPT

CMP603

Image Analysis and Computer Vision

Fall 2018

Instructor: Dr. Ahmed M. Darwish
Office 3702
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Time: Lecture: Tues. 6:00-8:00 PM Rm3701
Office hours: by appointment.

Course Description:

This is a one-semester course that addresses the fundamentals of the major topics of digital image and video processing and serves as an introductory course to computer vision and applications. Besides theoretical and mathematical basis, great attention will be given to applications with the objective that students become able to design and build image processing programs for a wide variety of applications. Research topics and areas of current interest will also be focused to help interested students to pick out a research point.

Course Objectives:

Help the student:

- Understand the theoretical foundations of different image processing techniques.
- Practice the fundamentals of image processing
- Explore the effect of different processing parameters on image appearance.
- Analyze problems and suggest and compare different candidate solutions.
- Decide what processing schemes are the most suitable for the problem under hand.
- Assess the performance of image processing algorithms for a target product.
- Use the presented techniques for other applications.
- Understand the upper limitations of current Computer Vision algorithms.
- Design simple computer vision systems.

Prerequisite:

- Good programming experience.
- Advanced linear algebra.
- Digital signal processing.

References:

- Castleman, K. R., *Digital Image Processing*, Prentice Hall, 1996, ISBN 013-211467-4.
- Gonzalez, R. C. and Woods, R. E., *Digital Image Processing*, Addison Wesley, 1993, ISBN 0-201-60078-1
- Jain, A. K., *Fundamentals of Digital Image Processing*, Prentice Hall, 1989, ISBN 0-13-336165-9.
- Gonzalez, R. and Wintz, P., *Digital Image Processing*, Addison Wesley 1987, ISBN 0-201-11026-1.
- Levine, M. D., *Vision in Man and Machine*, McGraw Hill, 1985, ISBN 0-07-037446-5.
- Ballard, D. and Brown C., *Computer Vision*, Prentice Hall 1982, ISBN 0-13-165316-4
- Marr, D., *Vision*, Freeman & Co 1982, ISBN 0-7167-1284-9.

- Several journals will be referenced, among them: IEEE Transactions on Pattern Analysis and Machine Intelligence, IEEE Transactions on Image Processing and others.

Course Material:

- Development environment is left for the student's choice.
- Several good shareware image processing programs could be downloaded from the web to minimize your time and investment on the course.

Detailed course content:

1. Introduction (perception, colour theory, ...)
2. Image sampling, quantization and digital representation.
3. Image transforms.
4. Image enhancement.
5. Image restoration.
6. Image and video compression.
7. Image reconstruction from projections.
8. Image analysis.
9. Machine vision and applications.
10. Image and video processors.
11. Selected topics

Grade distribution:

- 70 % Final Exam
- 30% Lecture Preparation and Delivery

Administrative:

- You are expected to attend all class meetings. You are responsible for all material covered in each lecture, for every announcement made any time during any class period and for any handouts. If you must miss a class, find out what you missed.
- **Honor System:**
Honor code adherence is expected in all phases of this class. All graded work is expected to be the original work of the individual, or of the team if allowed, unless otherwise directed by the instructor. In working on assignments, discussion and cooperative learning is allowed and, in fact, encouraged. Copying or otherwise using another team's programs, specific algorithms, or other detailed solutions to projects is an honor code violation. Please discuss any questions that you may have about what is permitted or not permitted with the instructor.
- **Special Needs or Circumstances**
Any students with special needs or circumstances should feel free to meet with the instructor.