University of Cyprus
Department of Computer Science

EPL447: Computer Vision

Fall Semester 2013

Teacher:	Dr Paris Kaimakis
Office:	Wing B, Office B107
Tel:	22892740
email:	pariskaimakis@cs.ucy.ac.cy
Office Hours:	Friday 15:00 – 16:00
Assistant:	Giorgos Nicolaides
Course Website:	http://moodle.cs.ucy.ac.cy/course/view.php?id=99

Course Description

Setting off from Computer Vision's humble origins and going on to its biggest achievements, students will receive an all-round perspective on this ever-advancing field. This course is an excellent basis for students to better grasp mathematical concepts taught in different courses, such as linear algebra, statistics, and calculus. Hands-on experience will also be provided in the form of software development.

Prerequisites

- MAS016: Linear Algebra,
- EPL231: Databases and Algorithms

Lectures and Lab Schedule

- Lectures: Tuesday and Friday, 13:30–15:00, Lecture Building 01, Room 002
- Lab: Wednesday, 16:00–17:30 Wing C, Lab B121

Syllabus

- **Introduction**
  Computer vision fundamentals; purpose and applications; historical background; human vision *vs* computer vision; framework and approach.
- **Low-level vision (2D vision)**
  Filtering; edge, corner, blob detection; robust features; segmentation; application: face detection.
- **Mid-level vision (2.5D vision)**
  Projective geometry; 3D and 2D transformations; camera models and calibration; application: image mosaicing
- **High-level vision (3D vision)**
  Stereo vision; depth recovery; 3D reconstruction; introduction to tracking; state-space representation; Bayesian inference; application: motion capture
- **Computer vision software development**

Aims

Upon the course's completion, students should:

- Understand the principles of vision.
- Appreciate the commercial potential of computer vision, but also understand the limitations of current methods.
- Identify computer vision's near-future goals.
- Apply mathematical and statistical methods as a means to solve vision-related problems.
- Be able to extract features of interest from images.
- Understand the process of perspective projection, be able to calibrate cameras, and manipulate 3D and 2D transformations.
- Be able to recover 3D shape information based on multiple viewpoints.
- Understand the principle of inference techniques such as the Kalman filter and the particle filter, and their use in 3D tracking.
- Be able to develop simple programs utilizing computer vision algorithms.

Assessment

Students' performance is assessed based on different metrics, with the following weights:

- Final exam (40%)
- Mid-term exam (25%)
- Assignments (20%)
- Coursework (10%)
- Participation (5%)

In order to qualify (pass), students **must**:

- Hand in all assignments and all coursework
- Participate in the mid-term exam
- Achieve at least 50% in the final exam
- Achieve at least 50% overall

Homework, Coursework and Plagiarism

Unless otherwise stated by the course instructor, homework and coursework that is to be completed outside contact time with the instructor must be done **on an individual basis**. This means that copying material from others is considered to be **plagiarism**.

Plagiarism is **not permitted,** and is also **not tolerated.**

Students caught plagiarizing somebody else's work will receive a significant reduction on the related assignment's mark, sometimes even down to **zero**. Students caught assisting others in plagiarizing will be penalized **in the same way**.

Bibliography

Students are recommended and encouraged to use the following book:

- David A. Forsyth and Jean Ponce, *Computer Vision: A Modern Approach*, PrenticeHall, international edition, January 2003.

The following books are also very insightful:

- Vishvjit S. Nalwa, *A Guided Tour of Computer Vision*, Addison-Wesley, February 1993.
- Gary Bradski and Adrian Kaehler, *Learning OpenCV*, O'Reilly, first edition, September 2008.
- Christopher M. Bishop, *Pattern Recognition and Machine Learning*, Springer, first edition, August 2006.

Happy reading!

Paris Kaimakis
September 2013