

Carleton University
School of Computer Science
COMP 5900: Geometry processing
Winter 2016
Course Outline

Contact

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Class Schedule

Classroom: River Building 3202
Class Times: Tuesdays and Thursdays, 2:35pm-3:55pm
Course Website: http://people.scs.carleton.ca/~olivervankaick/geomproc_winter_2016.html
Notes and references at cuLearn: <https://culearn.carleton.ca/moodle/course/view.php?id=62536>

Course Description

Recent advances in acquisition technologies (such as laser scanning) have facilitated the digitization of 3D objects with high resolution and accuracy. To address the challenges that arise from handling and using such complex data, the field of geometry processing has evolved. This course covers the latest concepts, representations and algorithms in geometry processing, to address the acquisition, reconstruction, analysis, manipulation, editing and fabrication of complex 3D models. The covered techniques have applications in computer graphics, engineering and many other areas, while the field is still the subject of much active work and presents opportunities for future research.

Topics Covered

- Surface representations and mesh data structures
- Differential geometry
- Registration and surface reconstruction
- Mesh smoothing and fairing
- Mesh simplification and compression
- Parameterization
- Mesh editing and deformation
- Shape analysis
- 3D printing and fabrication

Prerequisites

Experience with C++ programming, familiarity with basic calculus and linear algebra (vectors, matrices, etc.), and eagerness to study mathematical concepts and algorithms. Familiarity with computer graphics and/or computer vision and/or image processing are a plus.

Learning outcomes

At the end of this course, students will be able to:

- Summarize the main problems and solution methods in the field of geometry processing.
- Identify the most suitable techniques to address specific problems in geometry processing.
- Implement algorithms for processing of polygonal meshes and apply them to specific datasets.

Recommended book

M. Botsch, L. Kobbelt, M. Pauly, P. Alliez, and B. Levy, "Polygon Mesh Processing", A K Peters/CRC Press, 2010.

We will follow this book closely in the course. Each topic may also have additional references and suggested readings.

Evaluation

The grade will be based on the presentation of a paper, assignments, a take home exam, and a final course project. The idea is that the paper presentation and assignments will all converge to the same goal: the chosen paper will be ideally on the same topic as the project, while the assignments will set up the programming environment for working with 3D geometry and define the project. The project will consist in the implementation and evaluation of a geometry processing technique, followed by the submission of a report, code, and an analysis of the results.

University Policies

Student Academic Integrity Policy

Every student should be familiar with the Carleton University student academic integrity policy. A student found in violation of academic integrity standards may be awarded penalties which range from a reprimand to receiving a grade of F in the course or even being expelled from the program or University. Some examples of offences are: plagiarism and unauthorized co-operation or collaboration. Information on this policy may be found in the Undergraduate Calendar.

Plagiarism

As defined by Senate, "plagiarism is presenting, whether intentional or not, the ideas, expression of ideas or work of others as one's own". Such reported offences will be reviewed by the office of the Dean of Science.

Unauthorized Co-operation or Collaboration

Senate policy states that "to ensure fairness and equity in assessment of term work, students shall not co-operate or collaborate in the completion of an academic assignment, in whole or in part, when the instructor has indicated that the assignment is to be completed on an individual basis". Please refer to the course outline statement or the instructor concerning this issue.

Academic Accommodations for Students with Disabilities

The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website for the deadline to request accommodations for the formally-scheduled exam (if applicable) at <http://www2.carleton.ca/pmc/new-and-current-students/dates-and-deadlines>

Religious Obligation

Write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details visit the Equity Services website: <http://www2.carleton.ca/equity/>

Pregnancy Obligation

Write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details visit the Equity Services website: <http://www2.carleton.ca/equity/>

Medical Certificate

The following is a link to the official medical certificate accepted by Carleton University for the deferral of final examinations or assignments in undergraduate courses. To access the form, please go to <http://www.carleton.ca/registrar/forms>