Carleton University  
School of Computer Science  
COMP 5900Y: Geometry processing  
Winter 2018  
Course Outline

Contact
Instructor: Oliver van Kaick  
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Class Schedule
Classroom: Southam Hall 506  
Class Times: Tuesdays and Thursdays, 2:35pm-3:55pm  
Course Website: http://people.scs.carleton.ca/~olivervankaick/geomproc_winter_2018.html  
Notes and references at cuLearn: https://culearn.carleton.ca/moodle/course/view.php?id=98065

Course Description
The course covers concepts, representations, and algorithms for analyzing and processing 3D geometric models. We will discuss the geometry processing pipeline that starts with the acquisition of geometric models (e.g., with laser scanning or stereo imaging) and goes all the way to the fabrication (3D printing) of the models. More specifically, we will discuss the tasks of acquisition, reconstruction, analysis, manipulation, editing, and fabrication of complex 3D models, and representations such as triangle meshes and implicit functions. The techniques covered have applications in computer graphics, engineering, medical imaging, 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**
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

Preliminary course outline subject to change; last updated on Tue Dec 12 2017.