

Syllabus: GEO 577 Algorithms for Geographic Information Science

August 6, 2014

Instructor

Bernhard Jenny

Credits

4 (2 hours lecture, 4 hours lab)

OSU Catalog Course Description

An introduction to algorithms and data models for the manipulation and visualization of geospatial data. Students are introduced to object-oriented programming using the Java programming language.

Enforced Prerequisites

GEO 545, GEO 565, or equivalent, as well as GEO 578, GEO 568, or equivalent programming experience.

Course Description

This course teaches essential methods, algorithms, and data models for building geospatial software. Students are introduced to raster and vector data models and algorithms for the manipulation and visualization of geospatial data. The first part of this course introduces students to the Java programming language and concepts of object-oriented programming with a focus on geographic data. In the second part of this course, algorithms for modeling, analyzing and visualizing geographic information are discussed and programmed, such as terrain coloring and shading, spatial interpolation for heat maps, raster filter operations, object oriented modeling of points, lines and polygons, space partitioning, or clustering. During the third part of this course, students work on individual projects, applying the concepts of object-oriented programming and the Java programming language to develop software and algorithms preferably related to their thesis research.

Learning Outcomes

Students completing this course should be able to:

- Describe models and algorithms for geospatial vector and raster data.
- Understand object-oriented programming principles and tools. Know the features of the Java programming language, and apply Java for the development of algorithms for geospatial data.
- Analyze geospatial software problems, and apply programming methods to solve these problems.
- Evaluate, combine and adapt existing algorithms to solve problems involving geospatial data.

Evaluation of Student Performance

Quizzes	10%	In-class quizzes covering topics from lecture and reading assignments
Lab Assignments	40%	Java programming assignments
Student presentation	10%	Presentation of a paper or an algorithm
Project	40%	Individual programming project

Weekly Schedule

1	Introduction to Java
2	Raster filters
3	Object oriented programming with Java
4	Graphical user interface and Java graphics library, model–view–controller pattern
5	Terrain surface analysis and visualization
6	Vector data models (OGC Simple Feature Architecture) and vector rasterization

- 7 Geometry algorithms (intersections, point-in-polygon test, convex hull, clustering, line simplification)
- 8 Topological vector models, space partitioning (e.g. R-tree, quadtree, k-d tree)
- 9 Delaunay and Voronoi tessellations
- 10 3D graphics programming for scientific visualization

Disability Accommodation

Accommodations are collaborative efforts between students, faculty and Disability Access Services (DAS). Students with accommodations approved through DAS are responsible for contacting the faculty member in charge of the course prior to or during the first week of the term to discuss accommodations. Students who believe they are eligible for accommodations but who have not yet obtained approval through DAS should contact DAS immediately at 737-4098.

Student Conduct, Plagiarism Policy

Students are expected to follow the OSU Student Code of Conduct posted at http://arcweb.sos.state.or.us/pages/rules/oars_500/oar_576/576_015.html