GIS & Spatial Modeling

Raster-Based Modeling in GIS

Today’s Outline

• What is this course about: An introduction and learning objectives
• Some admin and rules (readings, labs)
• GIS 1-3 level courses in Geography
• You and Me: Your expectations and my thoughts about how to…
• Please correct the syllabus for Jeremy’s data: jmsmith@colorado.edu
  Wed 11am-12pm, Fri 2-3pm

This Course

• This is GIS “2”, which means, it follows from GIS 1
• Making use of the knowledge basis in GIScience and training in GIS tools
• Focus on raster-based modeling
• Important concepts in spatial analysis and modeling as well as algorithms used (behind the curtain)
• Toolsets, functions and operations available in raster GIS

This Course: Contents

• Raster datasets
• Raster analysis, map algebra and functional operations
• Terrain analysis: Slope/aspect, hydrologic functions, viewsheds
• Spatial estimation: Sampling, interpolation, prediction, core areas
• Data quality and uncertainty: Source data, processing, applications/use
• GIS and spatial modeling (model building, model design)

This Course: Contents

• Raster datasets: Properties and essentials
This Course: Contents

- Terrain analysis

This Course: Contents

- Spatial estimation:

This Course: Contents

- Data quality and uncertainty:

This Course: Contents

- Cartographic / static modeling:

The Labs

- Labs will be linked to the contents of the classes (hopefully you remember them while sitting in the labs)
- Here you will train your skills in using GIS tools (well, it’s only about one tool) for different modeling tasks
- You will get experience in using ModelBuilder of ArcGIS to create complex spatial models

Advanced topics:
- Fuzzy sets and soft computation in GIS
- Spatio-temporal models (CA, MAS)
- Spatial modeling and public health
- Advanced model logic and programming
Software / Tools

- We will use ESRI’s ArcGIS, but: This is not an ArcGIS course!
- While this is a good choice, remember there are MANY other GIS on the market of which MOST are cheaper or free
- Depending on resources and purpose the tool should be selected carefully
- And of course … You are already familiar with the software

Learning Objectives

- Learn about and understand important theoretical concepts in spatial analysis & modeling
- Understand algorithms of methods (of analytical tools and operators) used for modeling
- “Aware modeling” - uncertainty, complexity, scale and automation
- Training in working with GIS model tools and building complex models

Some Admin and Rules

- Lectures: M/W/F 1-1:50pm, Labs: M/W 9-10:50am
- Submitting lab assignments due date
- Labs mandatory!
- Course homepage: [http://www.colorado.edu/geography/class_hompages/geog_4203_s08](http://www.colorado.edu/geography/class_hompages/geog_4203_s08)
- Readings discussions - we are coming back to that
- Final projects - dito

Textbooks


Further textbooks recommendations:


You will find an additional list of readings in the syllabus

Readings Discussions

- Readings discussions on the following topics:
  - 23 Jan 08: Fields and Objects
  - 06 Feb 08: Terrain Models
  - 22 Feb 08: Spatial Interpolation
  - 07 Mar 08: Spatial data quality and uncertainty
  - 19 Mar 08: Spatio-temporal models
- Grad students leading discussion and have to pick a topic from the readings list (email - time stamp counts)
- Everybody (except discussion leaders) writes a 1-page summary (+ 1-2 questions) to be submitted on paper before the discussion
- Obviously, this implies: I expect you to be present!

Projects

- Starting week 12
- Small working groups, which focus on a chosen modeling problem
- Three presentations (proposal, progress report, final presentation) to the class
- Project leaders propose some problem and manage the project
- To become a project leader: Propose a problem by 13 Feb (plus GIS data in hand)
Grading

• Class participation (10)
• Lab assignments (subtotal of 100)
• Final project (subtotal 55)
• Readings (35)
• Leading reading discussion (20)
• No exams!!!

Who I am …

• Forestry studies, Geography program,…
• GiScience and uncertainty
• Historical maps & Cartographic pattern recognition
• Spatial dynamic models (ABM)

How I teach and what You will need to Do

• You talk too! – Ask me if you have questions or problems
• I will ask you questions, too! Chalk thinking exercises…
• Handouts to supplement your notes at the class homepage
• I expect you to come to labs regularly and to submit your work in time (remember presence is also required for student presentations - you will like it when it’s your turn…)

The GIS Levels at Geog …

• GIS 1: Fundamentals of GIS, data structures and operations
• GIS 2: GIS modeling, raster based approaches, concepts and techniques of modeling for complex spatial problems
• GIS 3: GIS programming, developing and implementing new functionality and methods for GIS and spatial modeling
• Classes will be continuously adapted to be in a logical and thematic sequence and for appropriate overlap / transition

Your Experiences and Knowledge

• I expect you to be experienced in ArcGIS, and that you have tried using ArcToolBox
• And You?
• Your motivation to come to this class, your future plans and intentions? Please fill out the short survey. This helps me to adopt the contents to your interests.