Geography 4203 / 5203

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
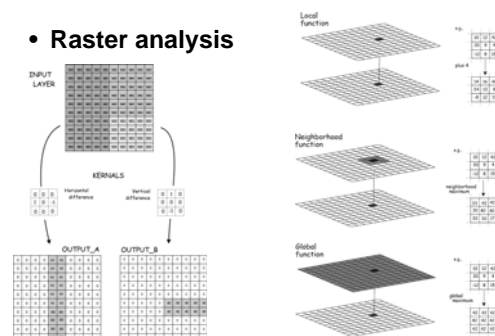- **GIS and spatial modeling** (model building, model design)

This Course: Contents

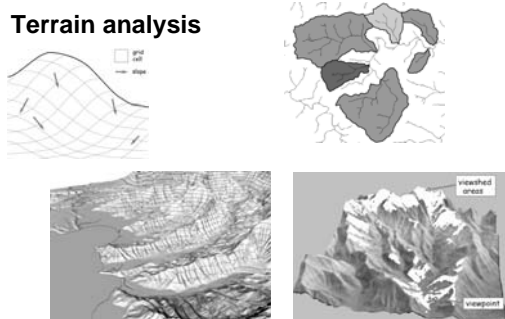- **Raster datasets**: Properties and essentials
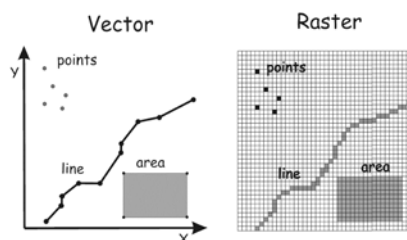
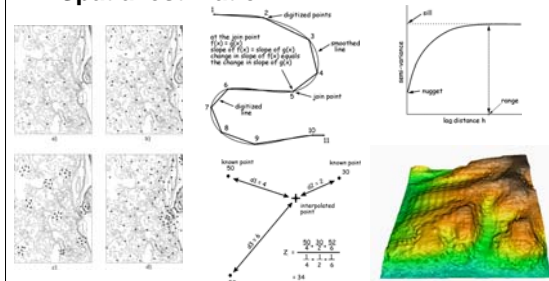## This Course: Contents

- **Raster analysis**

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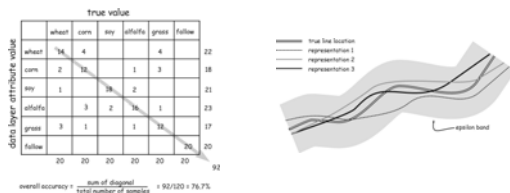
- **Terrain analysis**

This Course: Contents

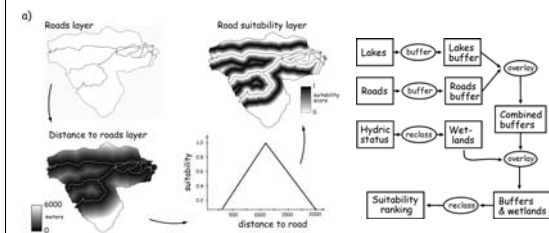- **Spatial estimation:**

This Course: Contents

- **Data quality and uncertainty:**

This Course: Contents

- **Cartographic / static modeling:**

This Course: Contents

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

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

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_homepages/geog_4203_s08
- **Readings** discussions - we are coming back to that
- **Final projects** - *dito*

Textbooks

- Bolstad, P. 2005 *GIS Fundamentals.* Minnesota: Eider Press. 2nd Edition
- DeMers, M. N. 2002 *GIS Modeling in Raster.* New York: Wiley (optional)

Further textbooks recommendations:

- Heywood, I., Cornelius, S. and Carver, S. 2006 *An Introduction to Geographical Information Systems.* Pearson – Prentice Hall, 3rd edition
- Burrough, P.A. and McDonnell, R.A. 1998 *Principles of Geographical Information Systems.* London: Oxford

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)
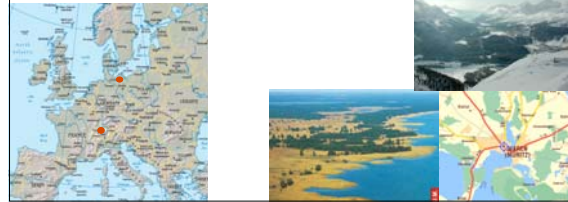
How I teach and what You will need to Do

- 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.