1. Spatial Data

Real World to a Map

www.bing.com/maps

www.openstreetmap.org

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GIS Data Modelling: Basic Principles

Physical Reality
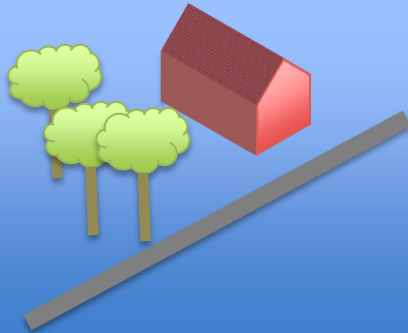Actual phenomenon as observed

1

Map with symbols
Lines, text, colour, etc.

5

Real world model
Entity:
-type
-attributes
-relationships

2

ID	Type	Coordinates	Lot_no	Owner
1	House	109,100, 109,200 200,300 300,109	A092002	Janssen
2	School	234, 450 450,700 700,409 409,234	B092007	St. Jozef
3	House	678,987 987,431 431,560 560,678	A092012	Smit

Database
Object:
-type
-attributes
-relationships
-geometry

4

Buildings
-categories: house, church, retirement home, school
-situated at: address / cadastral lot no.
-represented by: polygon (footprint)
Trees
-categories: oak, maple, birch
-situated at: cadastral lot no. / metres from public road
-represented by: single point

3

Data model
*Object*:
-type
-attributes
-relationships
-geometry

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What Techniques and Concepts Does GIS Use to Represent Spatial Data?

- Layers

- Spatial data vs. Attribute data

- Different data models for different types of entities (layers)

- Spatial reference system (coordinate system) → next week

Layers

- GIS stores similar data (features types (~ entity)) in separate layers

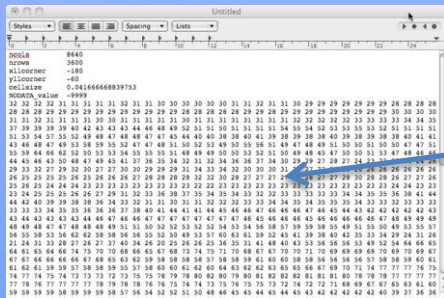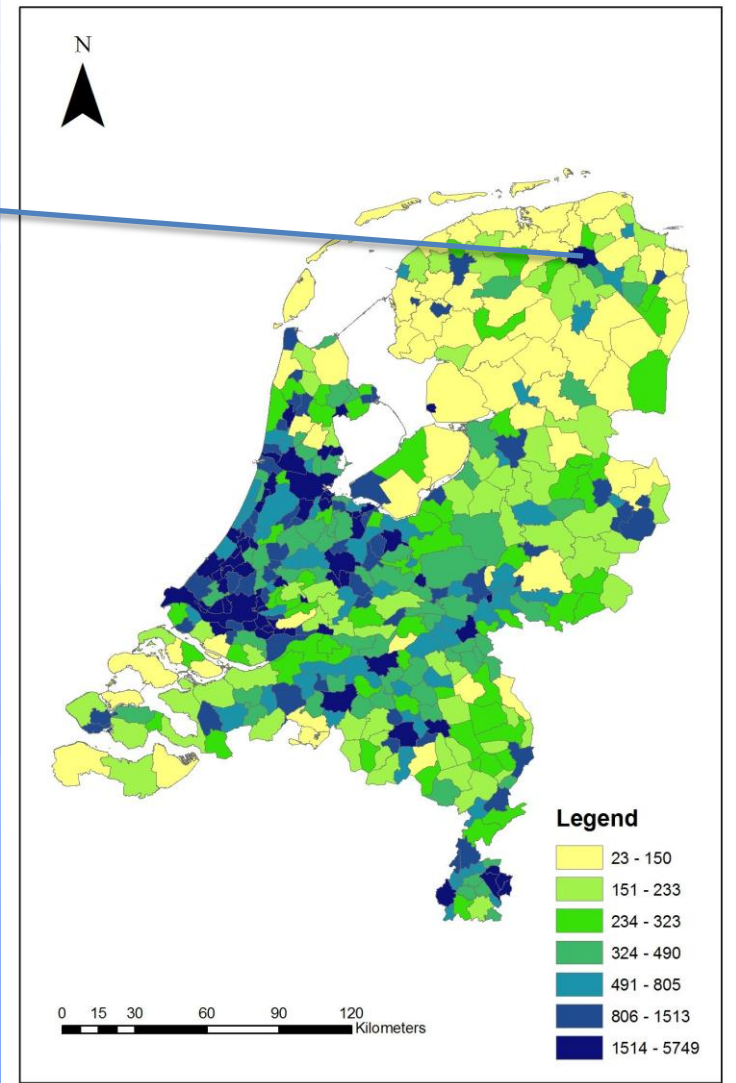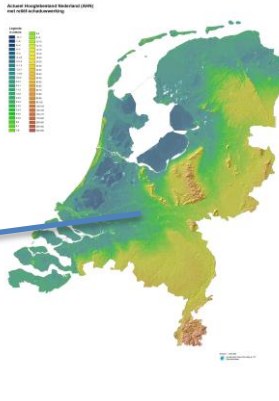- The location, expressed as x,y(,z) coordinate, is a unique identifier to link the different layers
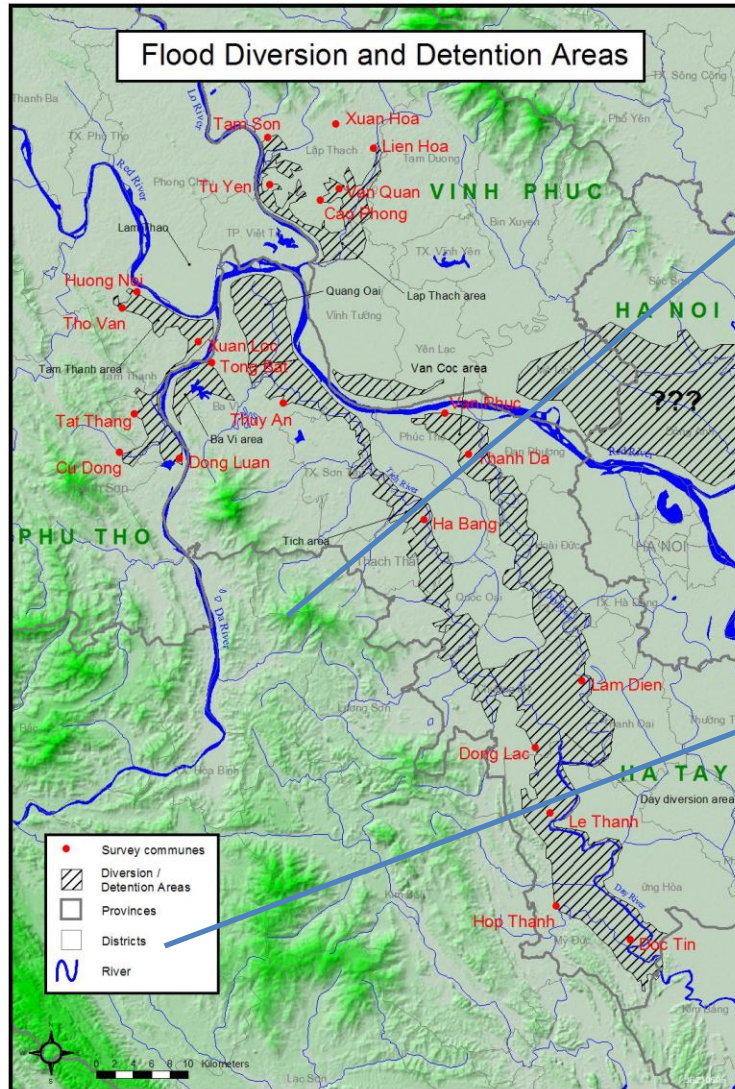

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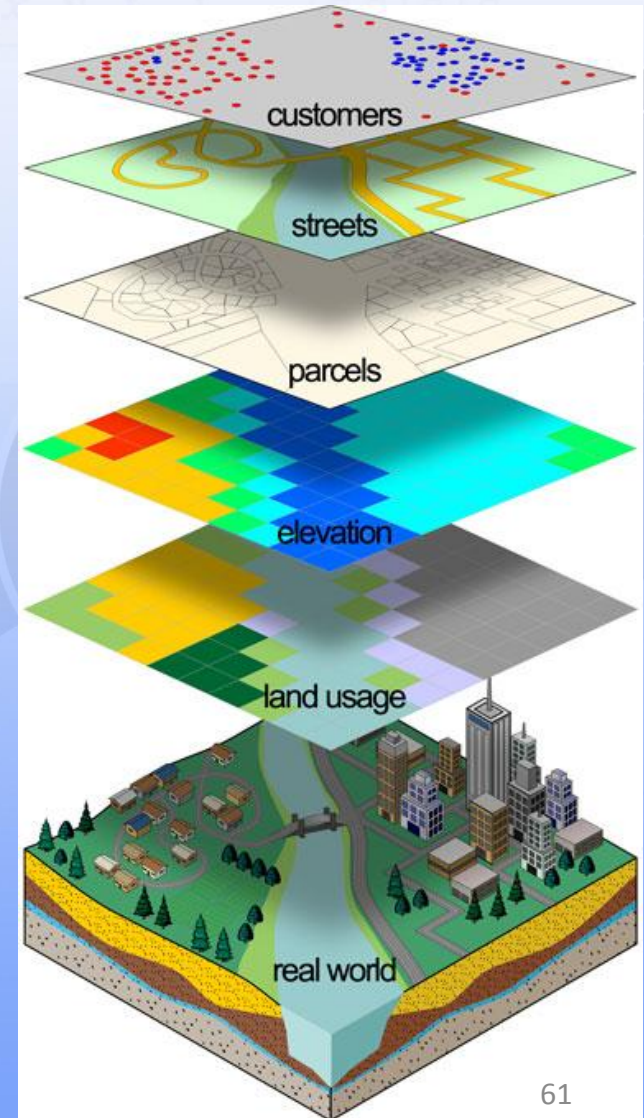
Spatial and Attribute Data

- Geographically referenced data consists of two parts:
    1. Spatial data: describes the location of spatial features
    2. Attribute data: describes the characteristics of spatial features

Spatial and Attribute Data

Raster Data and Vector Data

Flood Diversion and Detention Areas

Continuous features (background elevation)

↓

Raster Data Model

↕

Discrete features:
- point
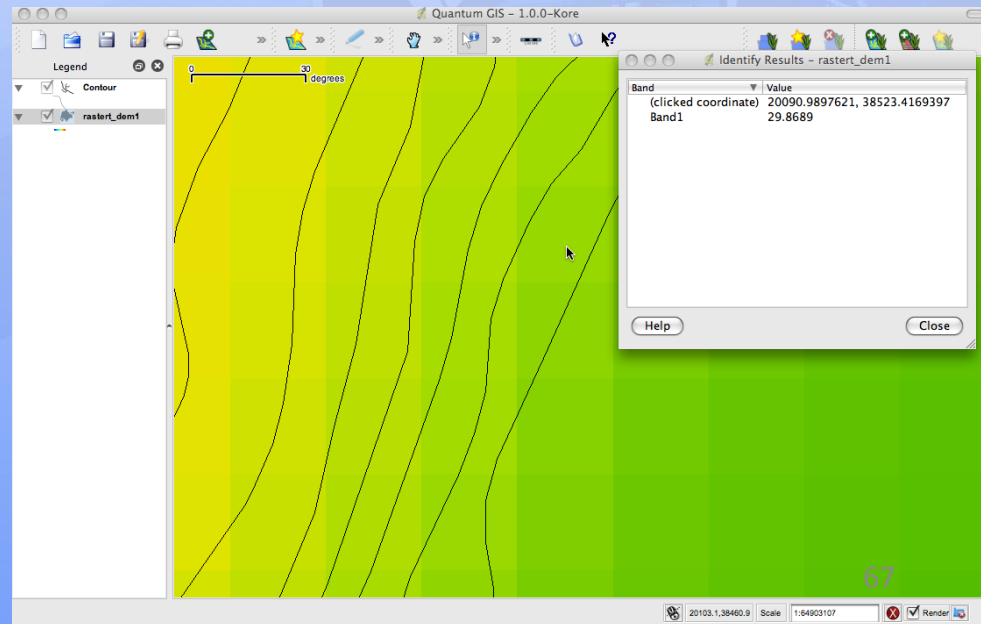- line
- polygon

↓

Vector Data Model

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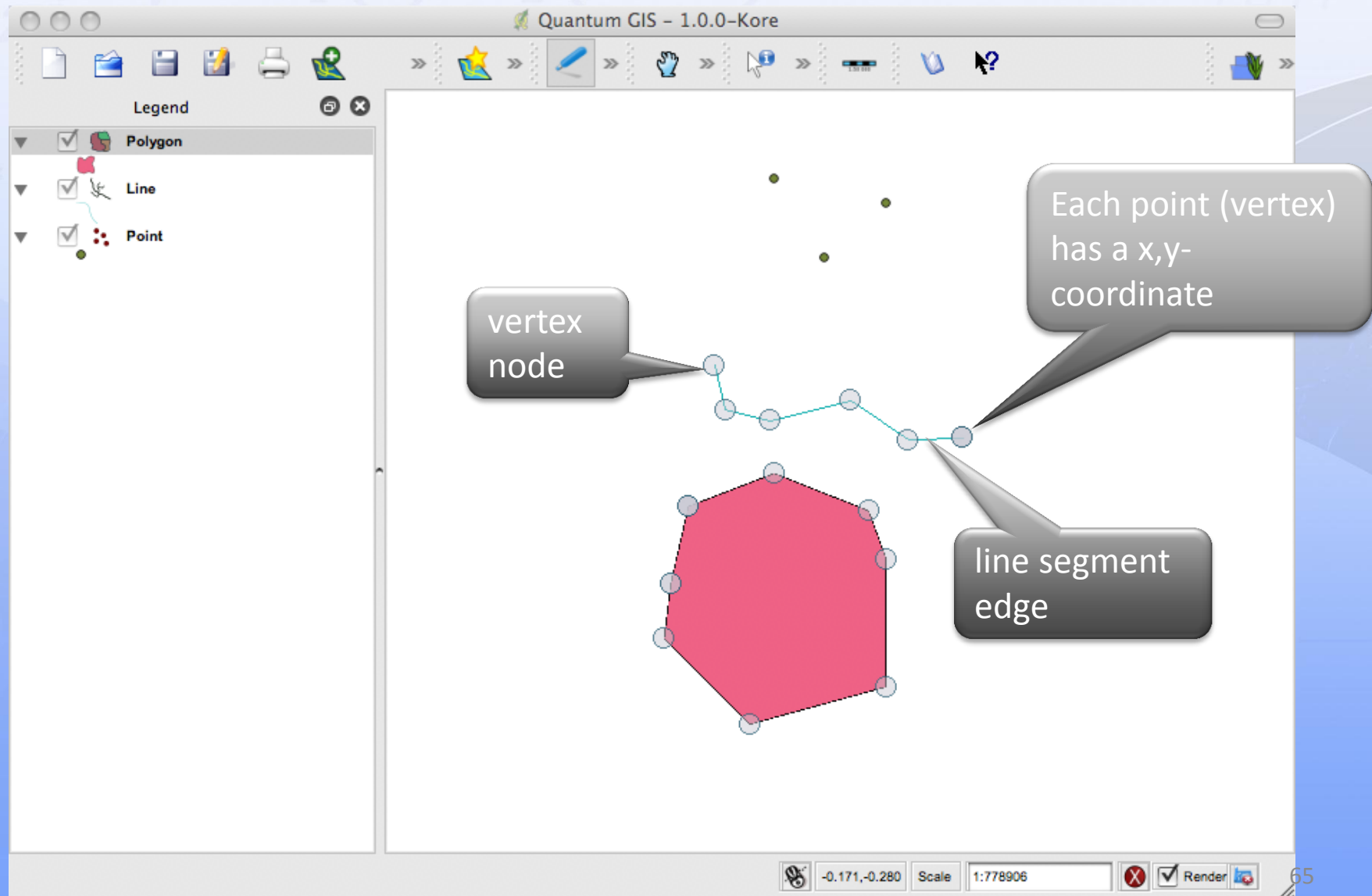
Vector Data Model

Raster Data Model
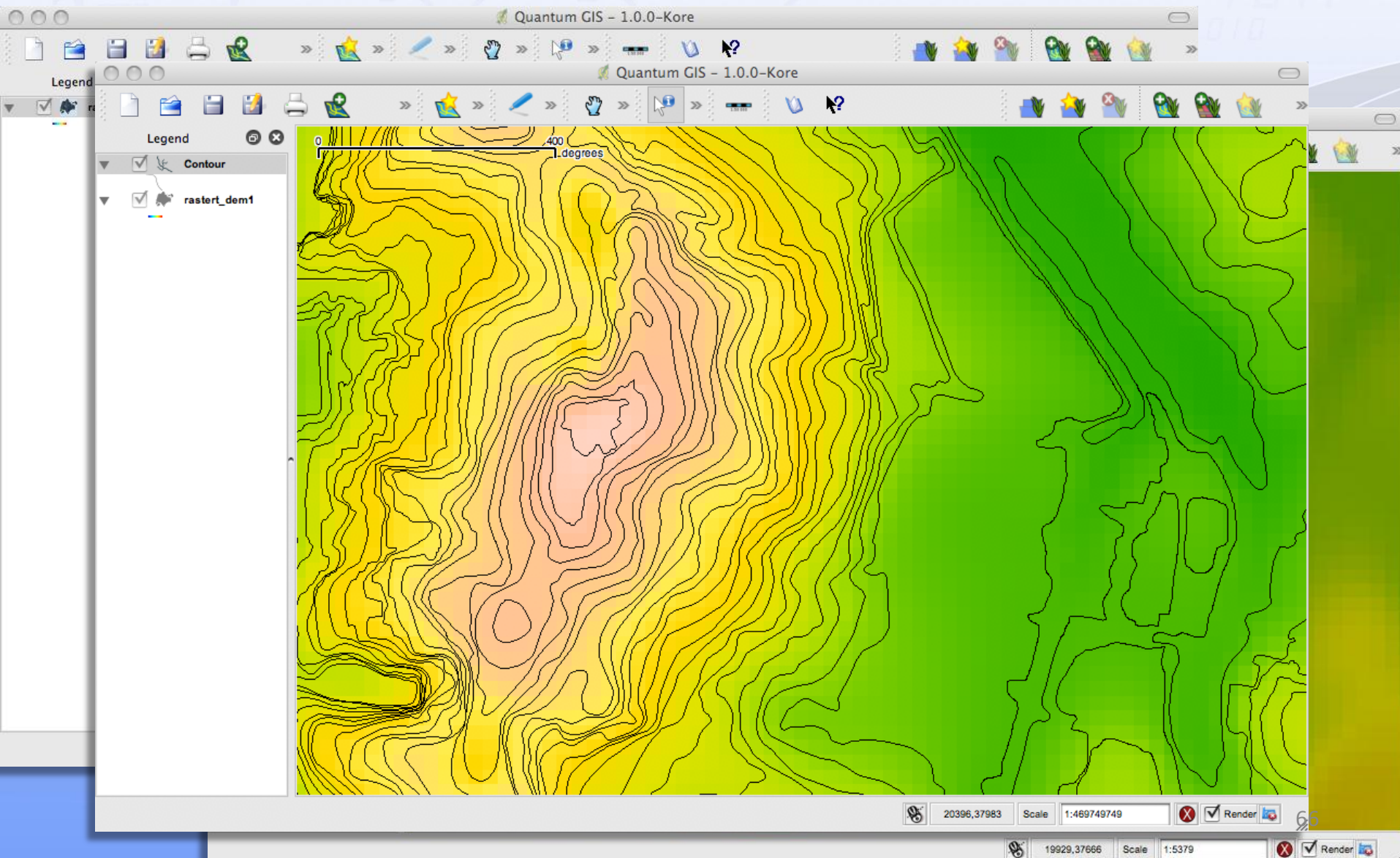
Raster Data Model

- raster, grid, surface, image

- rows, columns and cells

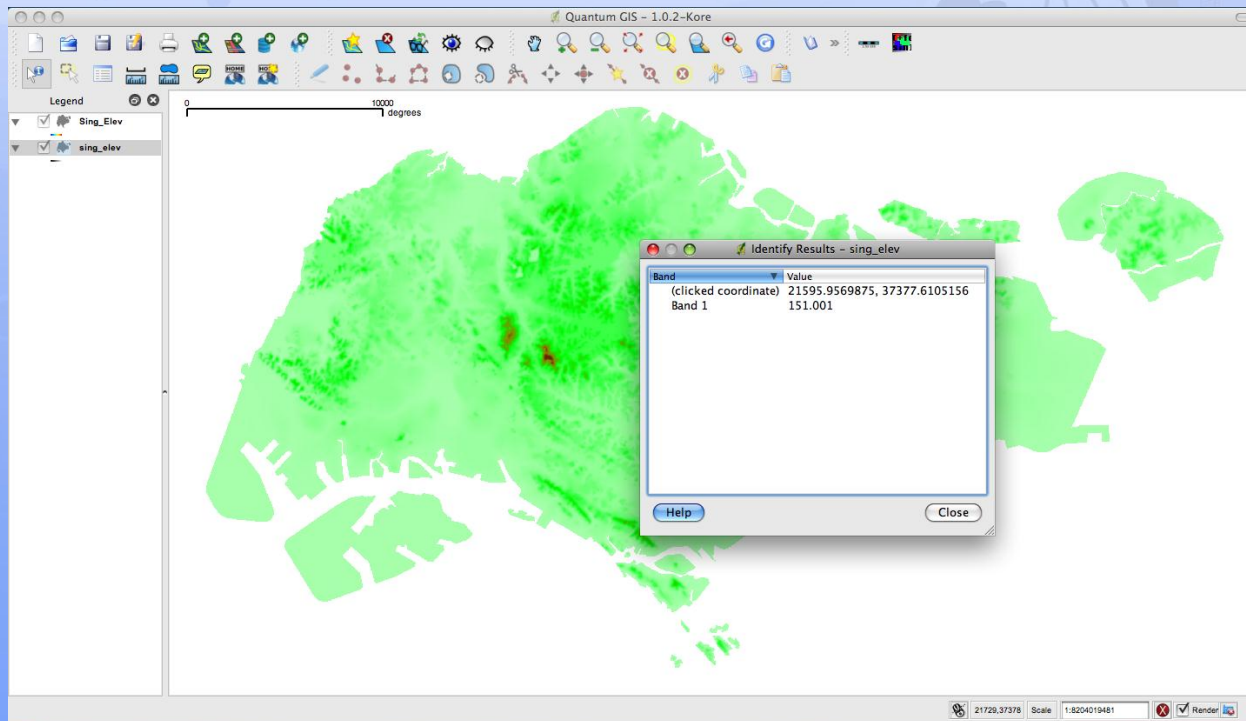- each cell contains a value

- size of cell: resolution

Other Data Models

- Object Oriented Data Model
- TIN (Triangulated Irregular Network) → elevation; higher efficiency than raster
- Regions Data Model → eliminate some of the limitations of polygons; regions may overlap, one region can consist of multiple polygons
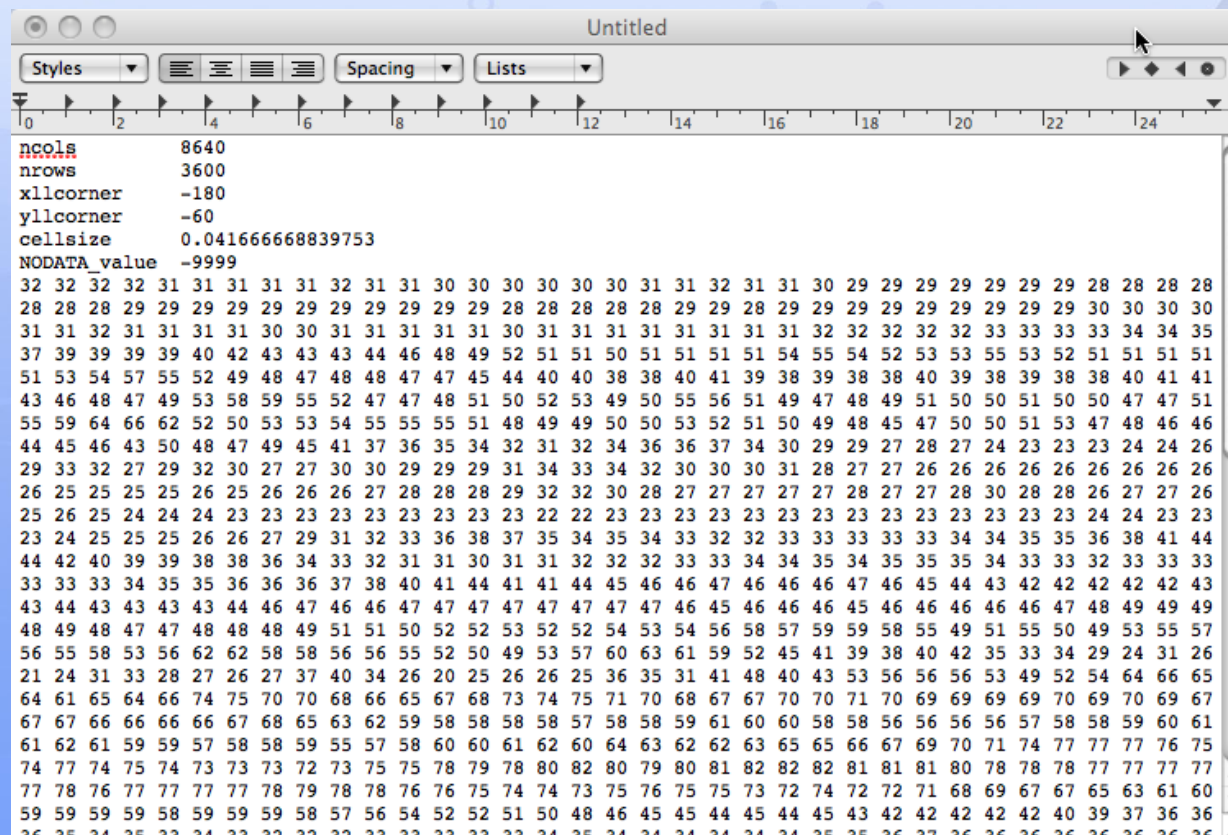- 3D data models (one x,y-coordinate has multiple z values)

Raster Data

- Raster data:
  - Spatial data: location of cell in grid
  - Attribute data: cell value

Raster Data Storage

- Simplest form: text file
- Contains limited spatial information

Raster Data Storage

- Many formats (images, better storage efficiency, more location data, better computational efficiency, etc.)

- Images can be accompanied by a projection file or projection information

- Images can contain more than one band per cell: multiple band data

Raster Data - Display

Single band data

Multiple band data