Introduction to ILWIS

Source: Cees van Westen
What is ILWIS?

• PC-based GIS & Remote Sensing package
• Developed by ITC
• A complete package:
  • image processing
  • spatial analysis
  • digital mapping
• Easy to learn and use:
  • full on-line help
  • extensive tutorials for direct use in courses
  • 25 case studies of various disciplines
Key features (1)

- Integrated raster and vector design
- Import and export of widely-used data formats
- On-screen and tablet digitizing
- Comprehensive set of image processing tools
- Orthophoto, image georeferencing, transformation and mosaicking
Key features (2)

• Advanced modeling and spatial analysis
• 3D visualization with interactive editing for optimal view finding
• Rich projection and coordinate system library
• Geo-statistical analyses, with kriging and co-kriging for improved interpolation
Unique concepts (1)

- **Object oriented approach**
  - data objects: raster or vector maps and tables
  - service objects: coordinate systems, georeference, representation, domain
    - objects may be shared: all maps of the same area use the same coordinate system
Unique concepts (2)

- **Domain:** defines the possible content of a map or table
  
in other words: what do the items in a map or table mean? Are they classes (such as landuse, soil) or values (DEM) or something else?

**Advantages:**
- use actual meaning of units
- sharing of domains for different maps and tables
- sharing of other objects for the same domain
- easy calculation
Unique concepts (3)

• Dependency link is stored: the link between data objects, derived from other data objects
  maps and table which are original are called source objects, those that are made from them are called dependent objects

Advantages:
- easy update
- easy change of calculation formulas
- minimum use of disk-space
- data retrieval without actual calculation
<table>
<thead>
<tr>
<th>Guide</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ILWIS Beginner’s Guide</strong></td>
<td>Introducing the basic concepts, essential ILWIS techniques and the main ILWIS- operations.</td>
</tr>
<tr>
<td><strong>ILWIS Reference Guide</strong></td>
<td>Detailed description of the functionality of ILWIS including its window types, objects, operations.</td>
</tr>
<tr>
<td><strong>ILWIS User’s Guide</strong></td>
<td>Training the skills you need in ILWIS, including explanations and procedures for first time users in addition to topics for advanced users.</td>
</tr>
<tr>
<td><strong>ILWIS Applications Guide</strong></td>
<td>Advanced procedures to work with ILWIS, providing case studies for various research disciplines</td>
</tr>
</tbody>
</table>
ILWIS Map Window

- Title bar
- Menu bar: always with the HELP function
- Button bar
- Map Viewer
- Status line
Pixel Information Window

ILWIS Pixel Information

- **Coordinate**: (802570.000000, 8080350.000000)
- **geol**: goa
- **GeolUnit**: Older alluvial deposits
- **Lithology**: Old alluvial deposits; pebbles, Quarternary
- **Landuse**: Shrubs and Low grass
- **Description**: Shrubs and low grasses
- **dem**: 2838
- **Rainfall**: PROMIC
- **January**: 93
- **February**: 89
- **March**: 81
ILWIS objects

Data objects:
- Raster maps
- Polygon maps
- Segment maps
- Point maps
- Map list
- Tables

Service objects:
- Domain
- Representation
- Georeference
- Coordinate System

Special objects:
- Map views
- Histogram
- Sample sets
- 2-dimensional tables
- Matrices
- Filters
- Functions
- Scripts
ILWIS objects

Domain

Defines the values, classes or identifiers that can be stored in a map or column

- **ID** for data objects that contain unique identifiers (for instance 1024, 1025, ...)
- **Class** for data objects that contain classes (for instance soil units like clay, sand, loam, ...)
- **Value** for data objects that contain measurable values (for instance height, concentration, ...)
- **Image** for satellite images and scanned images that contain values between 0 and 255
Spatial data
- Point map
- Segment map
- Polygon map
- Raster map

Attribute data
- Attribute table
- Column1
- Column2
- Column3
- Identifier
- Class domain
- ID domain
- Value domain
- Class repr.
- Class repr.
- Value repr.
Map Calculation

Input map: Landuse

Domain: Landuse

Bare rocks
Pasture
Lake

Ouput map: Rocks

Rocks=iff(landuse="bare rocks", landuse, "?")

Bare rocks
Pasture
Lake

Domain: lands

Land
water

Ouput map: Lands

Lands=iff((landuse="pasture")or(landuse="bare rocks"),"land","water")

Domain: bit

Pastarea = landuse = "pasture"

Ouput map: Pastarea

Pastarea = landuse = "pasture"
Reclassifying a map with attribute data

Map: City blocks

Attribute map: Land Use

Attribute table: City blocks

<table>
<thead>
<tr>
<th>Cityblocks</th>
<th>Landuse</th>
</tr>
</thead>
<tbody>
<tr>
<td>001</td>
<td>Institutional</td>
</tr>
<tr>
<td>002</td>
<td>Commercial</td>
</tr>
<tr>
<td>003</td>
<td>Commercial</td>
</tr>
<tr>
<td>004</td>
<td>Residential</td>
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<td>005</td>
<td>Residential</td>
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<tr>
<td>006</td>
<td>Residential</td>
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<td>Industrial</td>
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</tr>
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<td>014</td>
<td>Residential</td>
</tr>
<tr>
<td>015</td>
<td>Residential</td>
</tr>
</tbody>
</table>

Legend:
- c: Commercial
- i: Institutional
- i: Industrial
- h: Recreational
- r: Residential
- w: Water
ISL 2004
International Institute for Geo-Information Science and Earth Observation (ITC)

Arithmetic operations

domain value

MapA

<table>
<thead>
<tr>
<th>5</th>
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<tr>
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MapB

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<th>8</th>
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<tr>
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<td>8</td>
<td>8</td>
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</tbody>
</table>

MapC = MapA + MapB

<table>
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<th>15</th>
<th>15</th>
<th>12</th>
<th>12</th>
</tr>
</thead>
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<tr>
<td>16</td>
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MapC1 = MapA + 10

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MapC2 = ((MapA - MapB)/(MapA + MapB))*100

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<th>3</th>
<th>10</th>
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<td>11</td>
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<tr>
<td>71</td>
<td>71</td>
<td>-14</td>
<td>-14</td>
</tr>
</tbody>
</table>
Logical operations
domain class and value

MapA

MapD = (MapA = "forest") and (MapB < 500)

MapD1 = (MapA = "forest") or (MapB < 500)

MapD2 = (MapA = "forest") xor (MapB < 500)

MapD3 = (MapA = "forest") and not (MapB < 500)

F = forest
7 = 700 m.
6 = 600 m.
4 = 400 m.
Conditional functions
domain class and value

MapA

<table>
<thead>
<tr>
<th>F</th>
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MapB

<table>
<thead>
<tr>
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MapC

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MapC1

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