11.520:A Workshop on Geographical Information Systems
1.188: Urban Planning and Social Science Laboratory

Data Creation and Editing

Based in part on notes by Prof. Joseph Ferreira and Michael Flaxman

Lulu Xue | Nov. 3, 2010

Overview

- The intention of today's lecture
  - Part 1: Retrieving and creating GIS data from non-spatial data
  - Part 2: Editing GIS data

- Part 1: Now we have been exposed to several kinds of data sources:
  - Spatial data: shapefiles, coverage, satellite imagery
  - Attribute information: .dbf, .mdb
- Are these the only options we have?

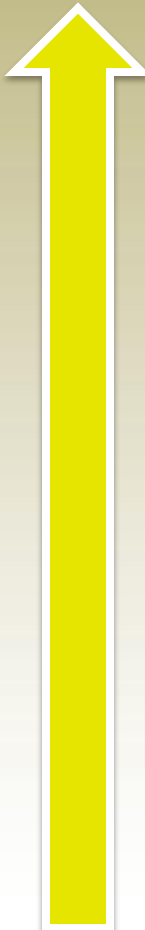# An example: Open street map

- open street map

Geospatial data in a broader sense

Less accurate &more conceptual

More precise

Mental maps

Place names

Addresses

Imagery

XY coordinates (or Z, or Time)

Data formats

Data collection 1: collecting data in the field

- Mini-Course:

  DUSP Field Data Collection Module (Dan Sheehan)

  2:00 – 4:00 PM, November 9\16\18\23

Digital footprints

Data collection 1: collecting data in the field

- How to get the (x, y) coordinates to show up in ArcGIS?

Data collection 1: collecting data in the field

Data collection 2: Digitizing Data

- There are several ways to digitize new features.
  - Digitizing a hard copy of a map on a digitizing board
  - Digitizing "on screen" or "heads up" over an image
  - Using automated digitization.

Heads-up Digitizing (Arc Edit)

- To enable the Editor toolbar in ArcMap, you need to have an existing feature class to edit
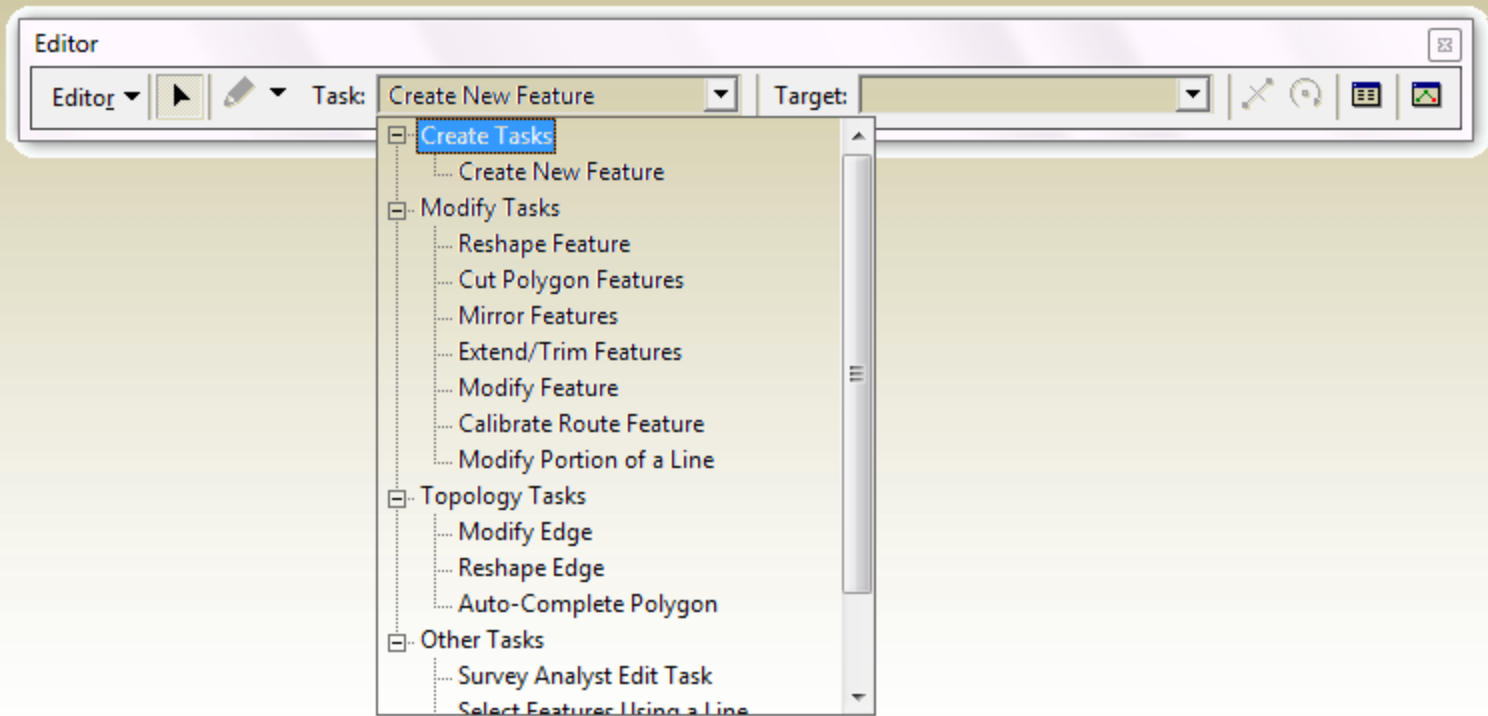
Heads-up Digitizing (ArcSketch)

- An add-on for ArcGIS that provides you with sketch tools to conceptualize and draw your map features
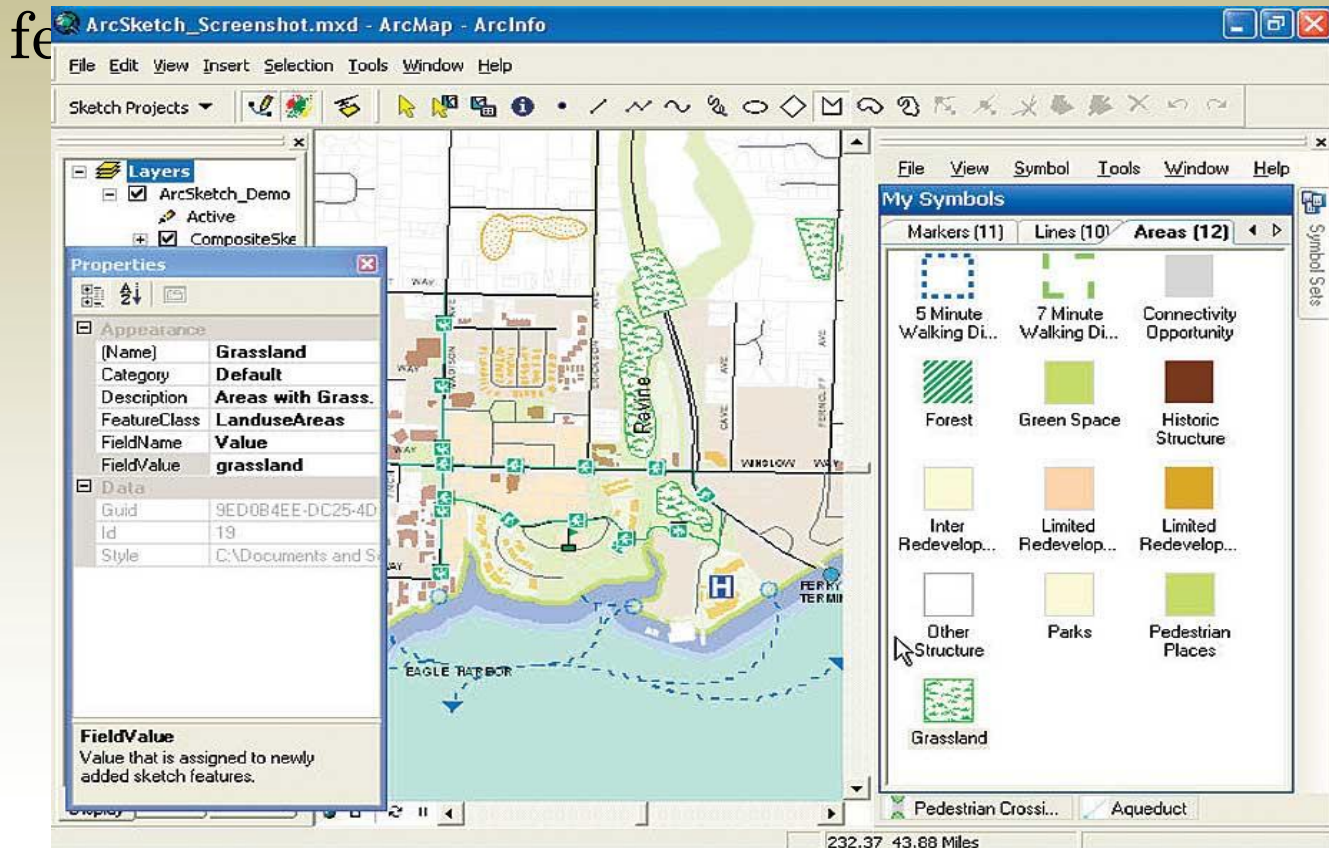
Free download available at ESRI website
http://www.esri.com/software/arcgis/extensions/arcsketch/index.html

Case 1: Digitizing Projected images

Demonstrate the use of ArcEdit to create a new shapefile of polygons via "heads-up" digitizing

- Projected image
- Unprojected image

- Create an empty shapefile in **ArcCatalog**
- Navigate to a writeable directory and choose File\New\Shapefile
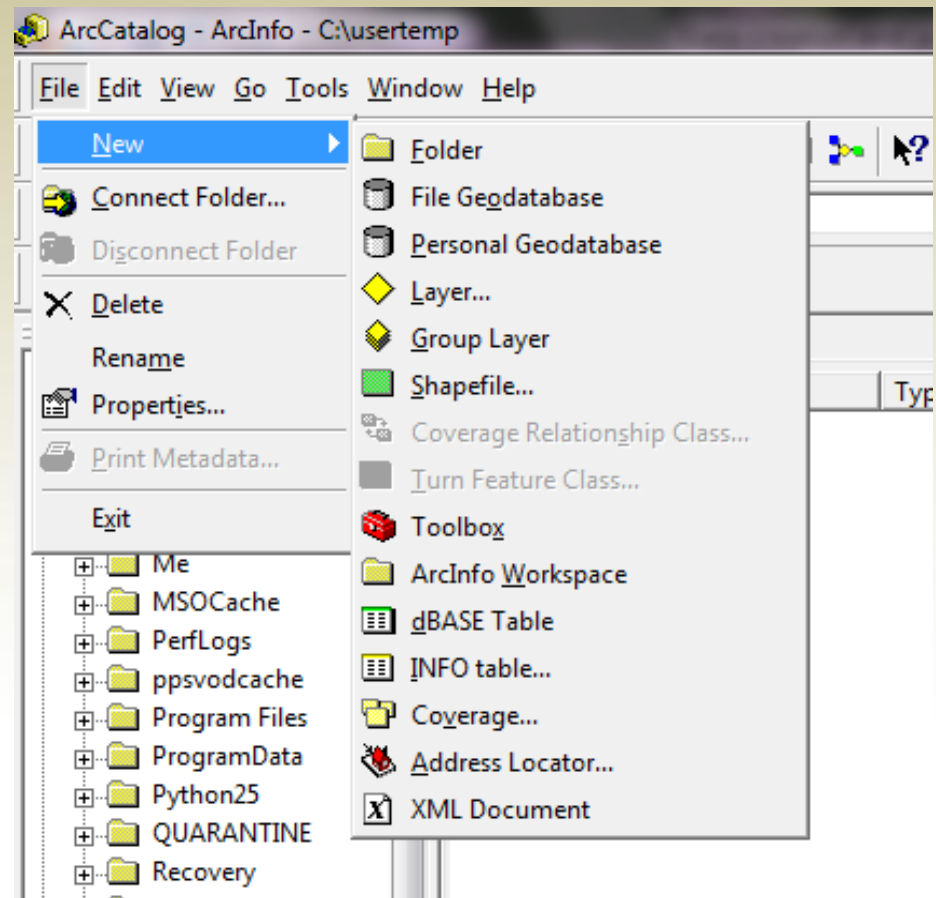
Case 1: Digitizing Projected images

- Specify polygon features
- Specify WGS 1984 Auxiliary coordinate
- Save the empty shapefile with a name such as **newpolys.shp**
- Add basemap (ArcGIS world layer) and empty newpolys . shp to ArcGIS

Create New Shapefile

Name: newpolys

Feature Type: Polygon

Spatial Reference

Description:

Geographic Coordinate System:
Name: GCS_WGS_1984_Major_Auxiliary_Sphere

☐ Show Details   Edit...

☐ Coordinates will contain M values. Used to store route data.
☐ Coordinates will contain Z values. Used to store 3D data.

OK   Cancel

Editor ⑤

Editor ▾ | Task: Create New Feature ③ | Target: STATES ②

Start Editing ①
Stop Editing
Save Edits
Move...
Split...
Divide...
Buffer...
Copy Parallel...
Merge...
Union
Intersect
Clip...
More Editing Tools ▸
Validate Features
Snapping... ④
Options...

1. Start an edit session (start editing).
2. Choose which layer within your workspace you want to be the target layer.

3. Choose whether you want to create new features or edit existing ones.

4. Set up additional properties or options, such as turning on snapping, setting which layers are selectable, and specifying input units.

5. Choose a tool. The Editor toolbar contains the most frequently used simple-feature editing tools.

6. Add or edit attributes of the feature.

7. Save edits and stop editing.

Case 2: Digitizing Unprojected images

- Before digitizing: check the coordination system of your image map.
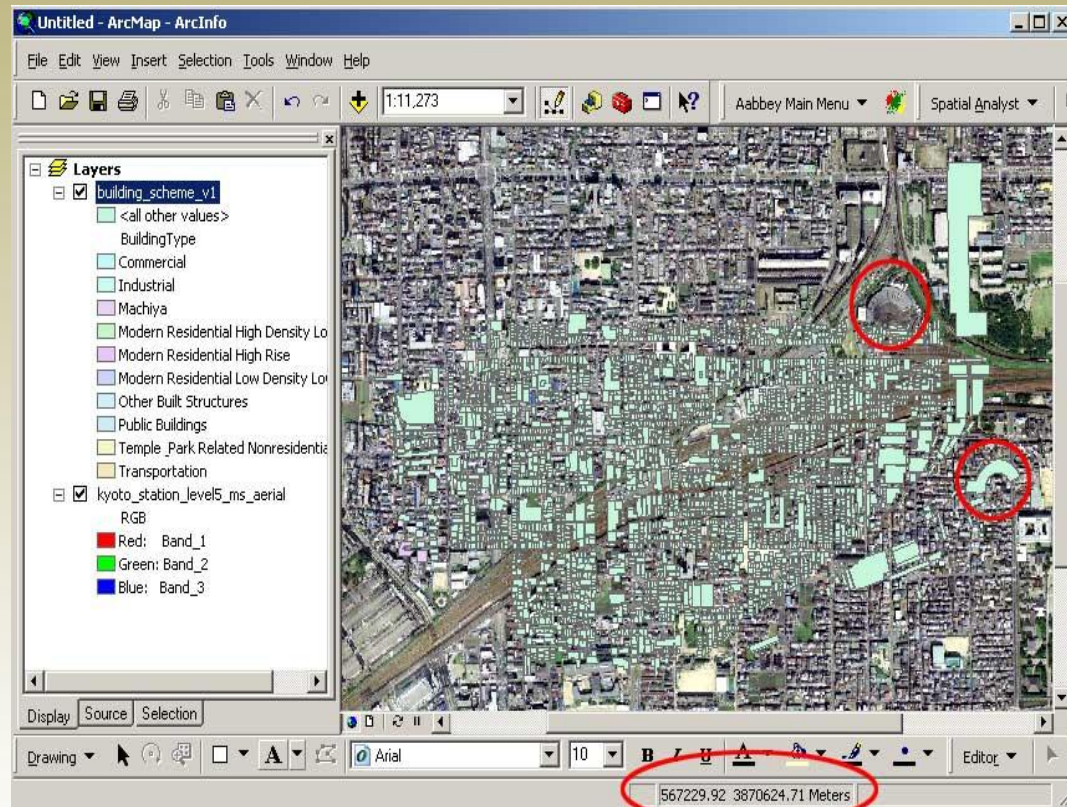
1. Scanned map datasets don't normally contain spatial reference information.

2. Satellite imageries don't align properly with other data you may have
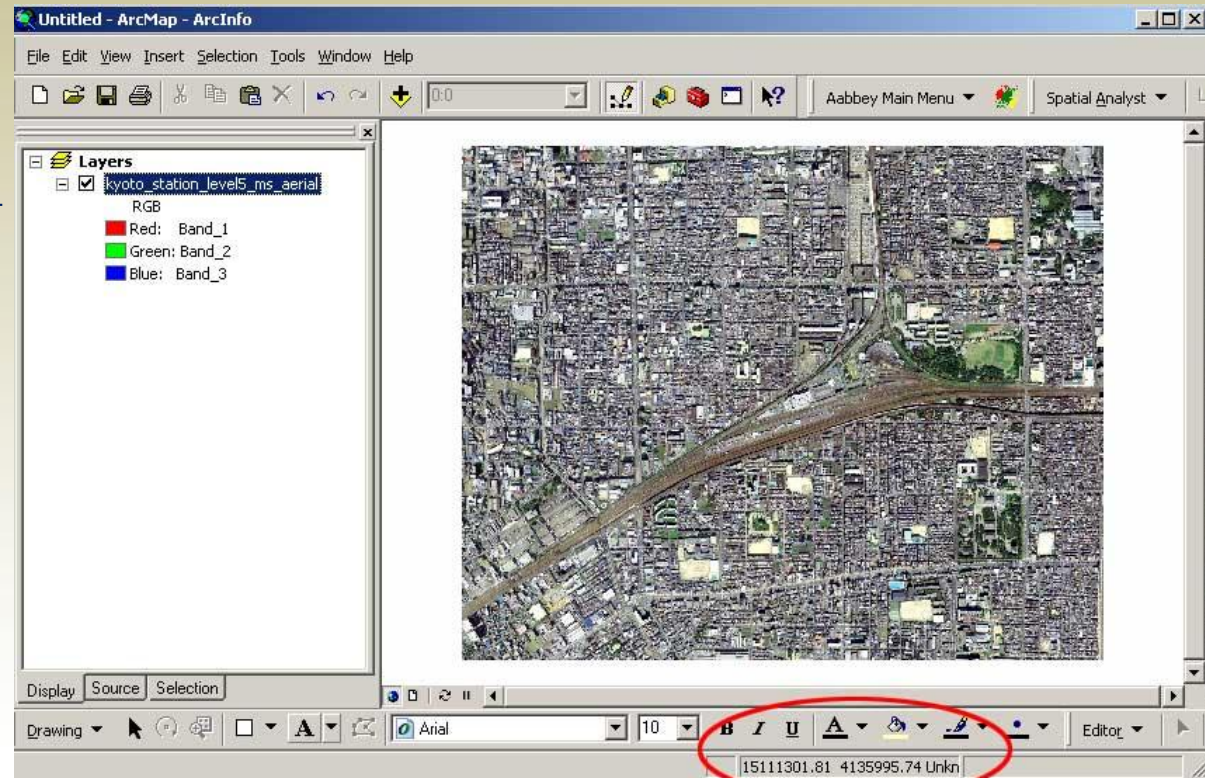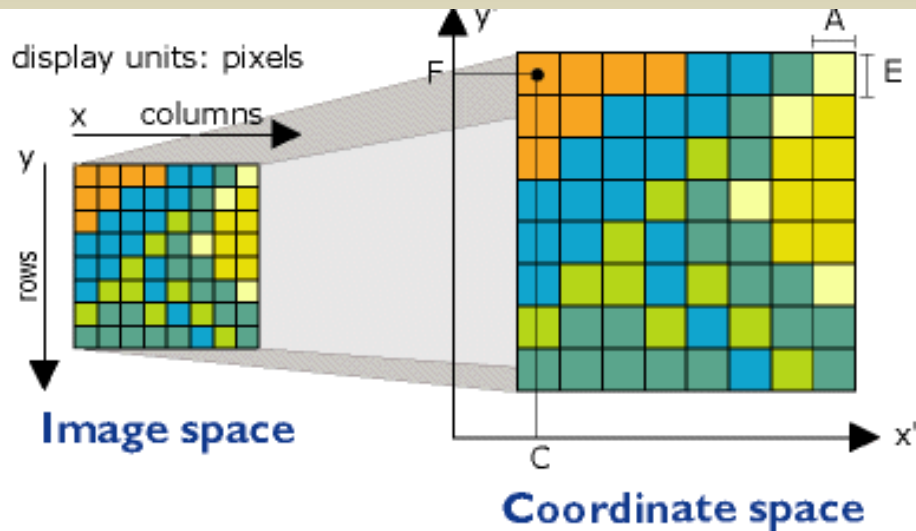
Case 2: Digitizing Unprojected images

Now we have a valid coordinate system, but our image is clearly pretty far from being correctly registered.

Georeferencing

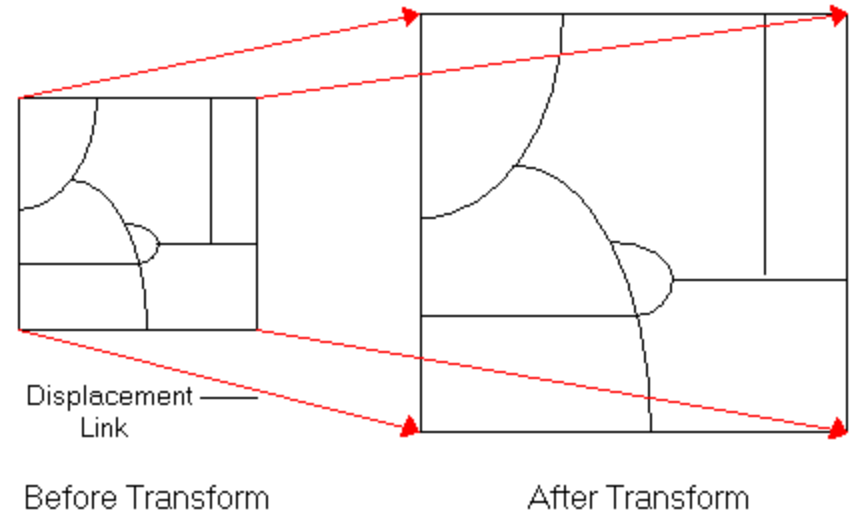**Georeferencing**
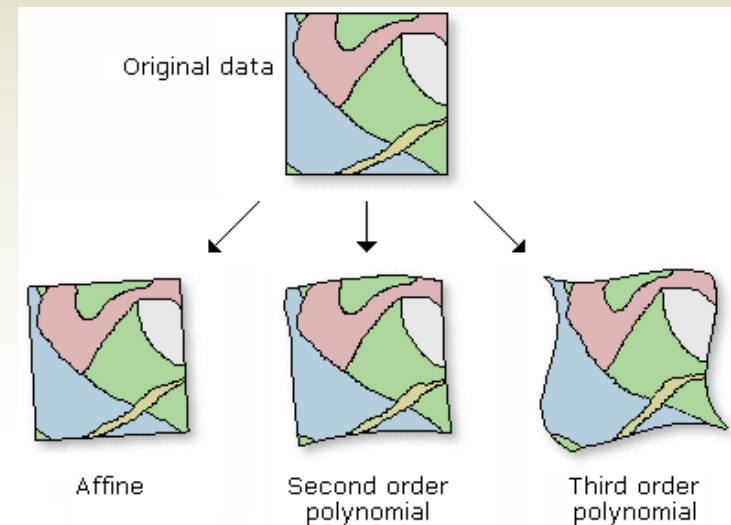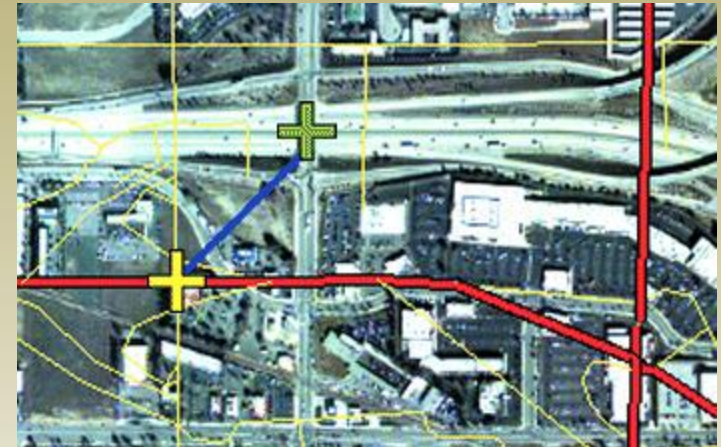align, or georeference **raster datasets**.

Spatial adjustment
transform, rubber-sheet, and edge-match **vector features**.

display units: pixels
x columns
y rows
Image space
F
A
E
C
x'
Coordinate space

Displacement Link
Before Transform
After Transform

Georeferencing

1. Add the raster dataset that you want to align with your projected data in ArcMap.

2. Add control points that **link known raster dataset positions** to **known positions in map coordinates (the order matters!)**.

3. Save the georeferencing information when you're satisfied with the alignment.

4. Optionally, permanently transform the raster dataset.

Original data

Affine

Second order polynomial

Third order polynomial

An example of spatial adjustment

Geospatial data in a broader sense

Less accurate &more conceptual

Mental maps

Place names

Addresses

Imagery

XY coordinates (or Z, or Time)

More precise

Data formats

Geocoding

- **Geocoding** is the process of finding associated geographic coordinates (often expressed as latitude and longitude) from other geographic data

- Geocoding typically uses *Interpolation* as a method to find the location information about an address.
    - E.g., if the address along one side of a block range from 1 to 199, then address Number = 66 is about one-third of the way along that side of the block.
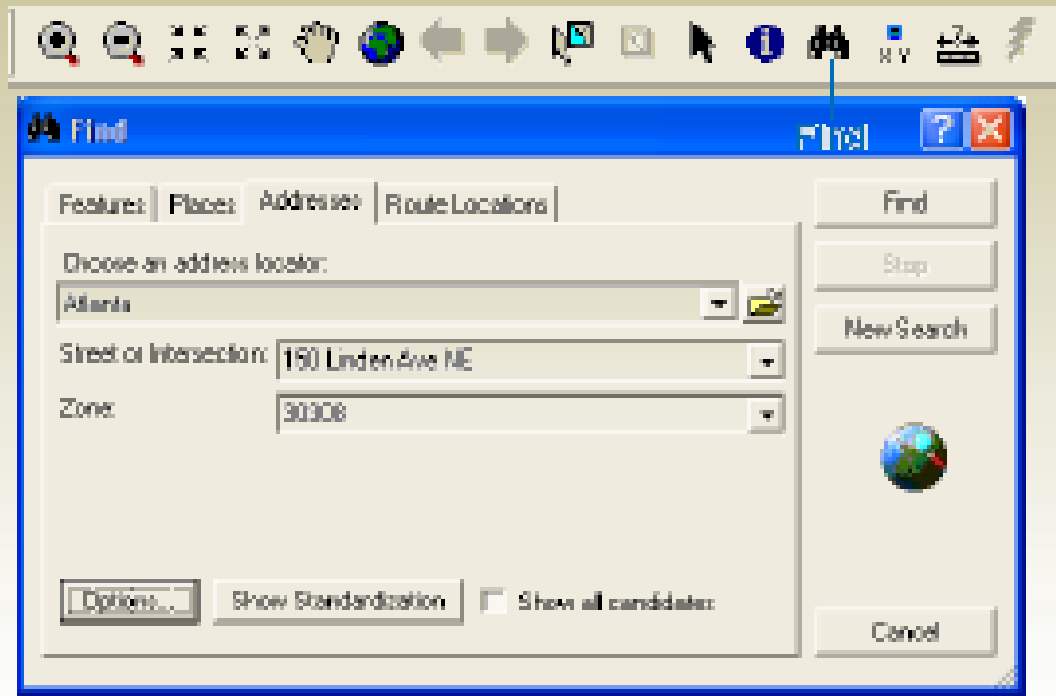
Geocoding

- Data needed for geocoding:
  - A list of addresses saved as a database or a text file
  - Street centerlines with street names and address ranges one both sides of streets.
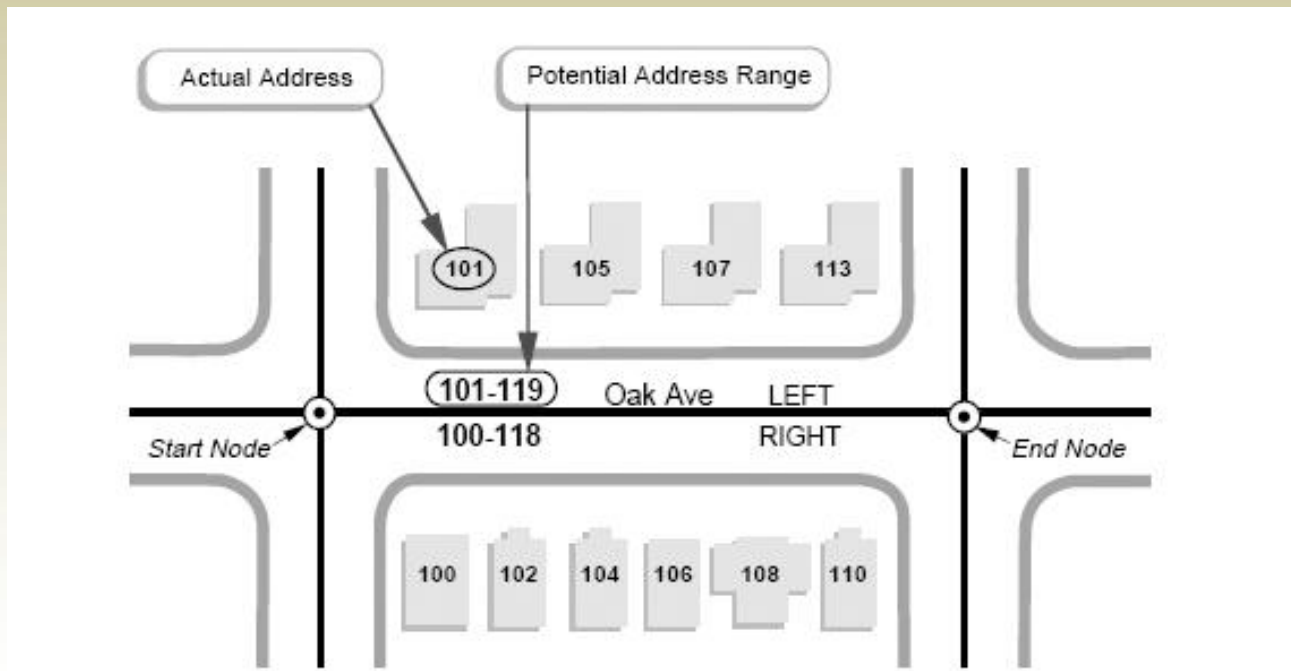
- Limitations?

Online Geocoding

- Sometimes you just need to find one or a few addresses and mark them on a map.
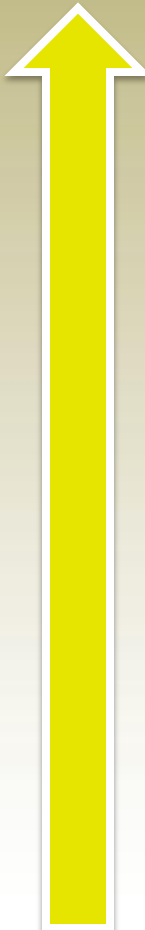
- ArcGIS online World Geocoding (free webservice)

- Googlecode

http://gmaps-samples.googlecode.com/svn/trunk/geocoder/singlegeocode.html

Geospatial data in a broader sense

**Less accurate
&more conceptual**

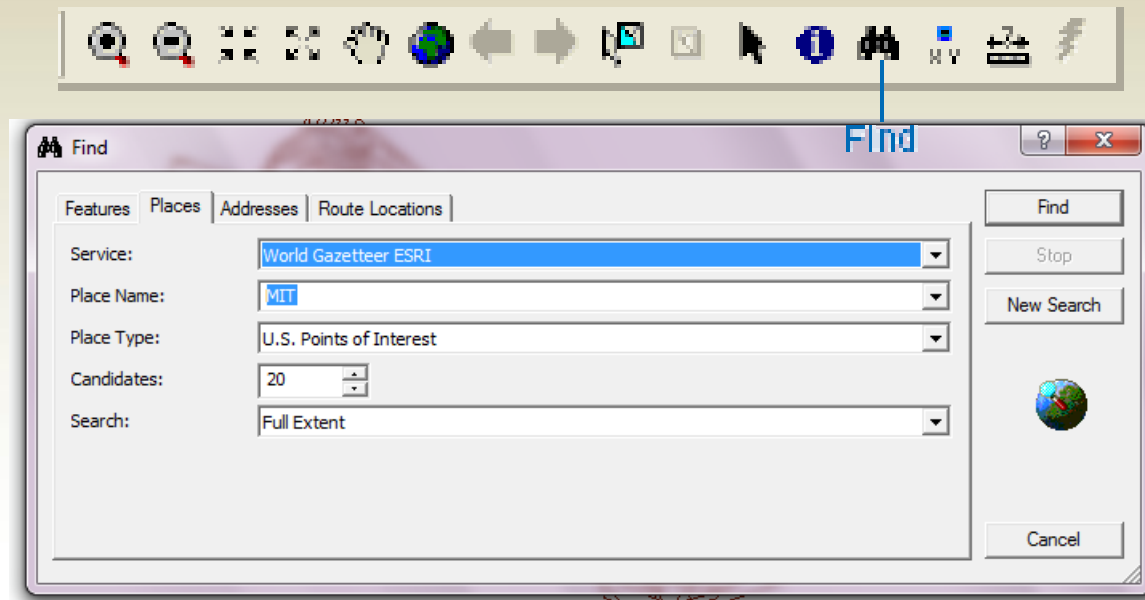**More precise**

Mental maps

Place names

Addresses

Imagery

XY coordinates (or Z, or Time)

Data formats
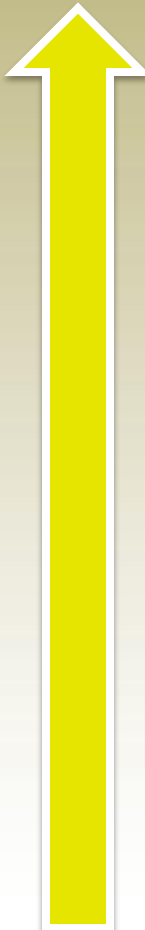
Look up place names in Gazetteer

- **A place name**—One or more keywords that can be used to search for a place (e.g., a country, city, river, or any geographic feature).

- **A description of the place**—A statement clearly identifying the place.

Geospatial data in a broader sense

Less accurate &more conceptual

Mental maps
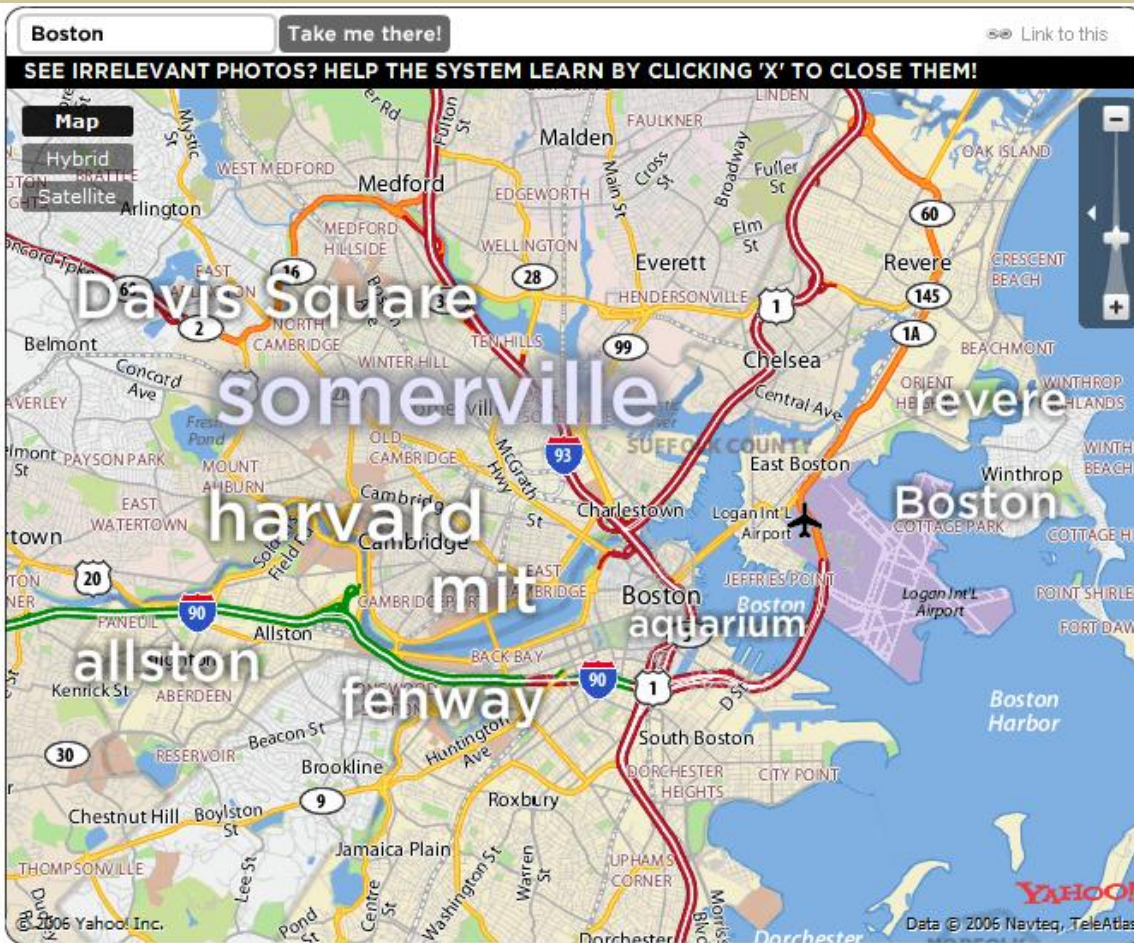
Place names

Addresses

Imagery

XY coordinates (or Z, or Time)

More precise

Data formats

Conceptual (or mental) maps

TagMaps: The aim of TagMaps is to provide a mental map of the city by using the photos and tags uploaded by photographers on the Flickr image sharing website.