



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](#)



The Free Wiki World Map

OpenStreetMap is a free editable map of the whole world. It is made by people like you.

OpenStreetMap allows you to view, edit and use geographical data in a collaborative way from anywhere on Earth.

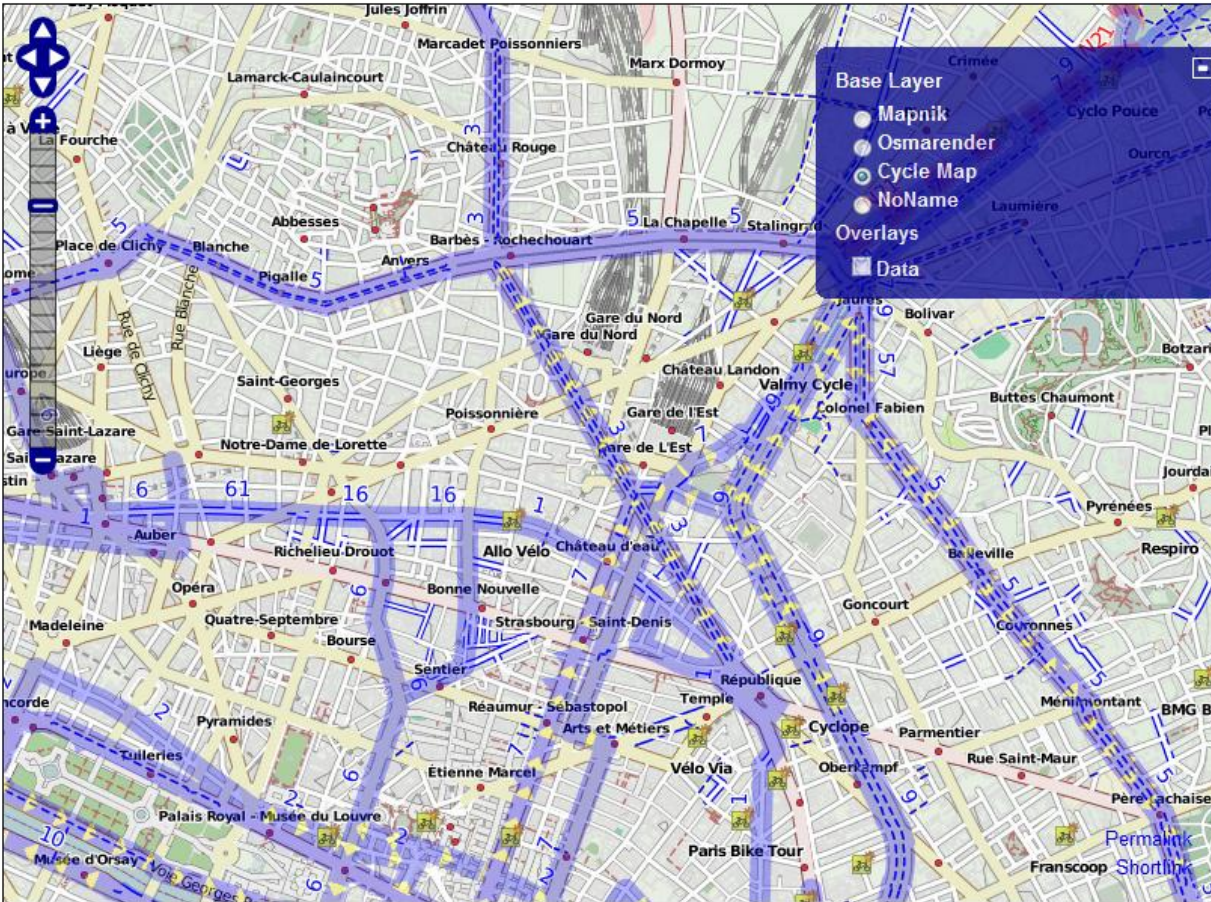
OpenStreetMap's hosting is kindly supported by the UCL VR Centre and bytemark. Other supporters of the project are listed in the [wiki](#).

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Map key

Search [Where am I?](#)

examples: 'Alkmaar', 'Regent Street, Cambridge', 'CB2 5AQ', or 'post offices near Lünen'

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Base Layer

- Mapnik
- Osmarender
- Cycle Map
- NoName

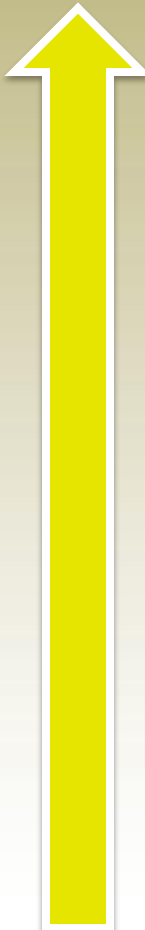
Overlays

- Data



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

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?

The screenshot shows the ArcMap interface with the 'Tools' menu open and 'Add XY Data...' selected. The 'Attributes of bizlist' table is visible, showing columns for AV_ADD, AV_ZIP, AV_STATUS, AV_SCORE, AV_SIDE, X, and Y. The table contains 30 records of address data with their corresponding X and Y coordinates.

AV_ADD	AV_ZIP	AV_STATUS	AV_SCORE	AV_SIDE	X	Y
100 CAMBRIDGESIDE PLACE	02141	M	65	R	234746.159871	902321.318314
550 MASSACHUSETTS AVENUE	02139	M	100	R	232689.126758	901644.565782
100 CAMBRIDGESIDE PLACE	02141	M	65	R	234746.159871	902321.318314
30 JFK STREET	02138	M	52		230983.534464	902117.765635
12 BOW STREET	02138	M	100	R	231611.629989	902406.745422
1675 MASSACHUSETTS AVENUE	02138	M	100	L	231278.746503	903582.152169
52 JFK STREET	02138	M	52		230983.534464	902117.765635
31 SMITH PLACE	02138	M	61	L	223678.015153	909102.927509
111 MOUNT AUBURN STREET	02138	M	100	L	231060.610193	902560.396862
6 PLYMPTON STREET	02138	M	100	R	231523.846883	902490.770394
2269 MASSACHUSETTS AVENUE	02138	M	80	L	220904.662325	910799.231697
2269 MASSACHUSETTS AVENUE	02138	M	80	L	220904.662325	910799.231697
2269 MASSACHUSETTS AVENUE	02138	M	80	L	220904.662325	910799.231697
2211 MASSACHUSETTS AVENUE	02140	M	100	L	230781.416535	904797.053752
333 LONGWOOD AVENUE	02138	M	67	L	232420.257211	898687.054026
99 MOUNT AUBURN	02138	M	81	L	231121.728392	902531.498223
84 MASSACHUSETTS AVENUE	02139	M	100	R	233393.846646	901036.837678
2211 MASSACHUSETTS AVENUE	02140	M	100	L	230781.416535	904797.053752
186 HAMPSHIRE STREET	02139	M	100	R	232927.280876	902533.659589

Data collection 1: collecting data in the field

Attributes of bizlist

AV_ADD
100 CAMBRIDGESIDE PLACE
550 MASSACHUSETTS AVENUE
100 CAMBRIDGESIDE PLACE
30 JFK STREET
12 BOW STREET
1675 MASSACHUSETTS AVENUE
52 JFK STREET
31 SMITH PLACE
111 MOUNT AUBURN STREET
6 PLYMPTON STREET
2269 MASSACHUSETTS AVENUE
2269 MASSACHUSETTS AVENUE
2269 MASSACHUSETTS AVENUE
2211 MASSACHUSETTS AVENUE
333 LONGWOOD AVENUE
99 MOUNT AUBURN
84 MASSACHUSETTS AVENUE
2211 MASSACHUSETTS AVENUE
186 HAMPSHIRE STREET
30 JFK STREET

Add XY Data

A table containing X and Y coordinate data can be added to the map as a layer

Choose a table from the map or browse for another table:

bizlist

Specify the fields for the X and Y coordinates:

X Field: X

Y Field: Y

Coordinate System of Input Coordinates

Description:

Unknown Coordinate System

Show Details

Warn me if the resulting layer will have restricted functionality

OK Cancel

V_SIDE	X	Y
	234746.159871	902321.318314
	232689.126758	901644.565782
	234746.159871	902321.318314
	230983.534464	902117.765635
	231611.629989	902406.745422
	231278.746503	903582.152169
	230983.534464	902117.765635
	223678.015153	909102.927509
	231060.610193	902560.396862
	231523.84683	902490.770394
	220904.662325	910799.231697
	220904.662325	910799.231697
	220904.662325	910799.231697
	230781.416535	904797.053752
	232420.257211	898687.054026
	231121.728392	902531.498223
	233393.846646	901036.837678
	230781.416535	904797.053752
	232927.280876	902533.659589
	230983.534464	902117.765635

Options

Display Source Selection Favorites Index Search Results

Drawing Arial 10 B I U

Adds a new map layer based on XY events from a table 220673.453 912201.738 Unknown Units

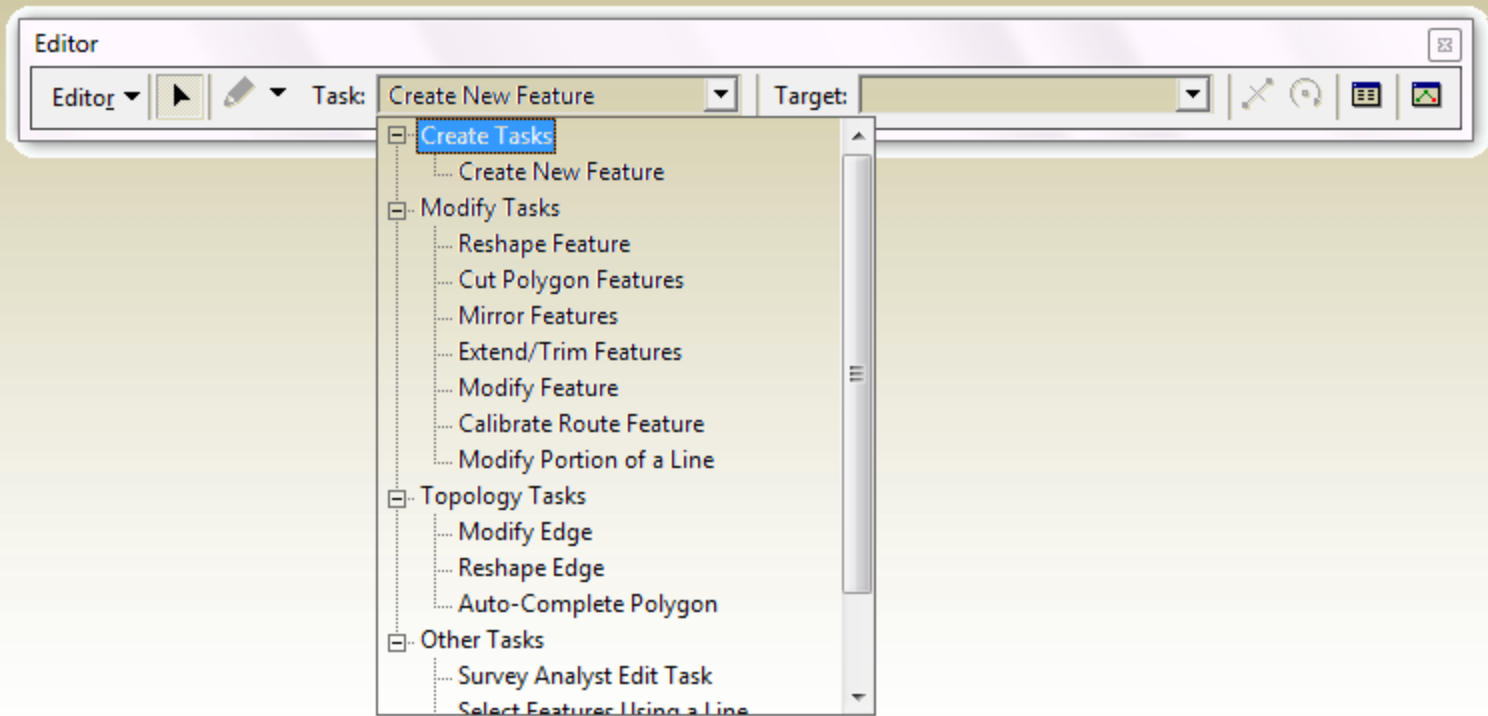
Data collection 2: Digitizing Data

- 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.



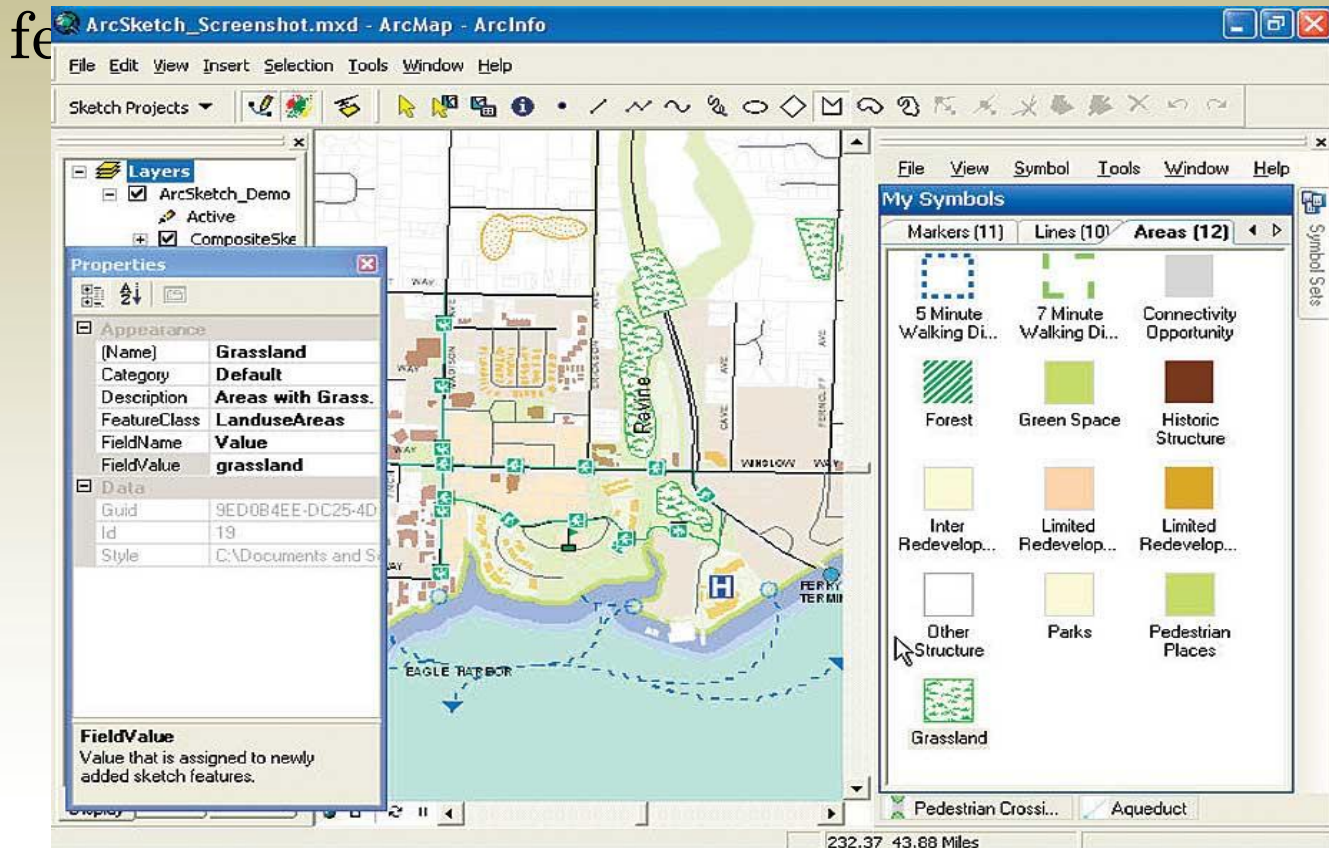
Heads-up Digitizing (Arc Edit)

- 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



Free download available at ESRI website

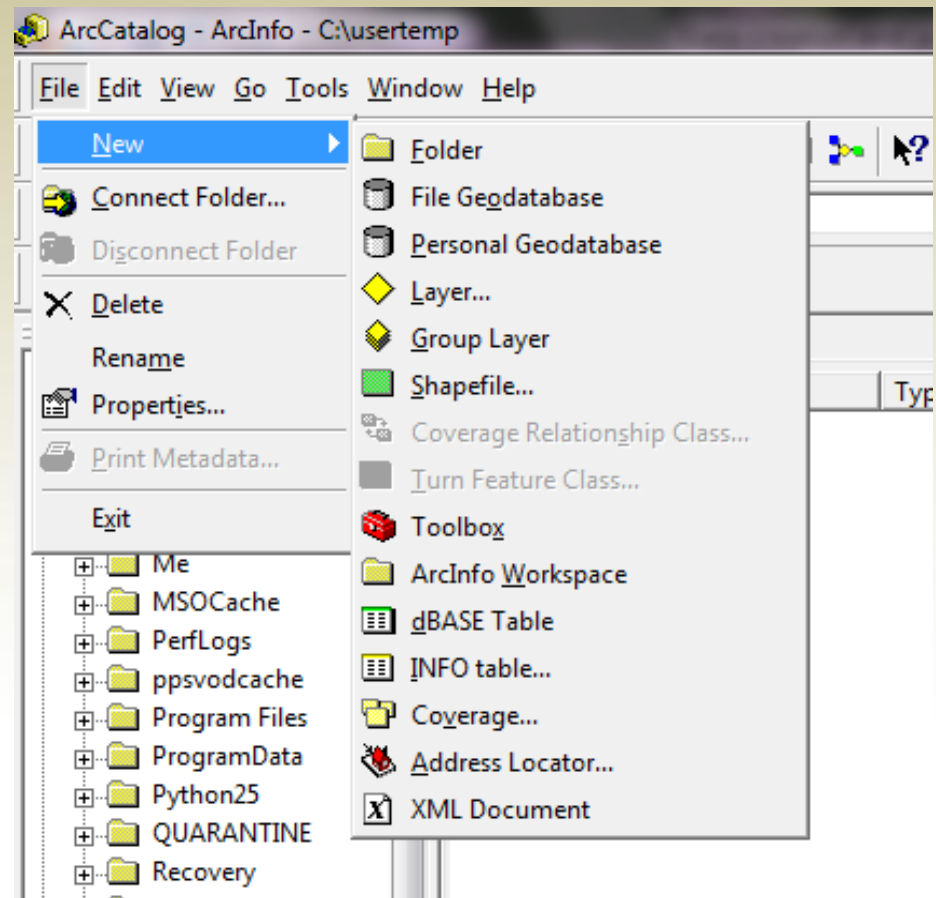
<http://www.esri.com/software/arcgis/extensions/arcsketch/index.html>

Case 1: Digitizing Projected images

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

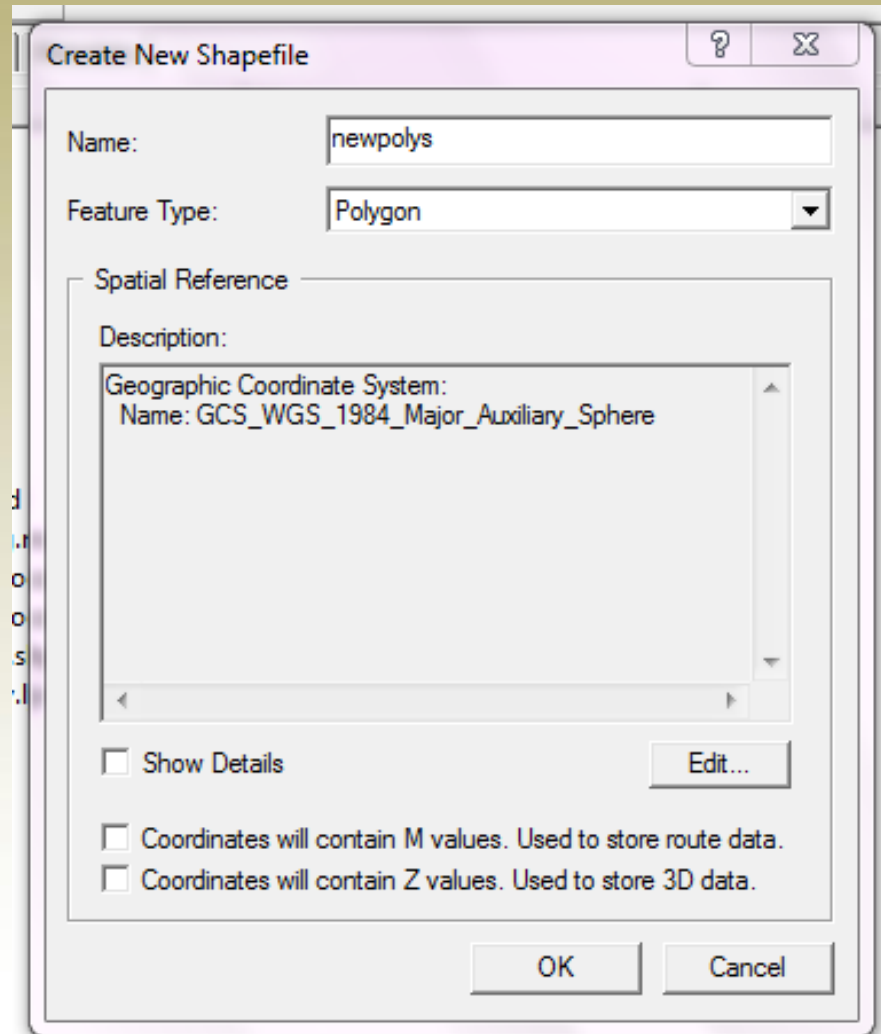
- Projected image
- Unprojected image

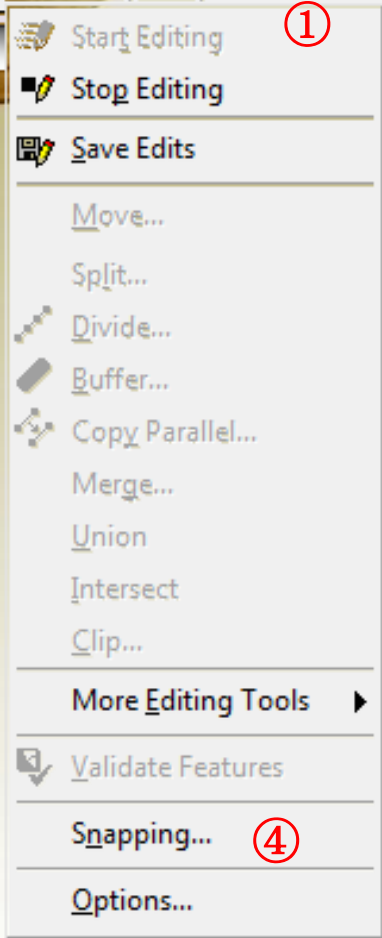
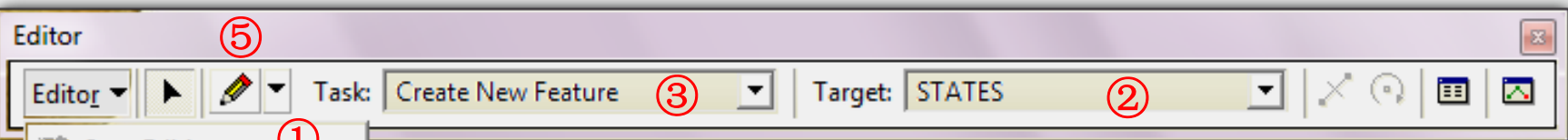
- Create an empty shapefile in **ArcCatalog**
- Navigate to a writeable directory and choose **File\New\Shapefile**



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



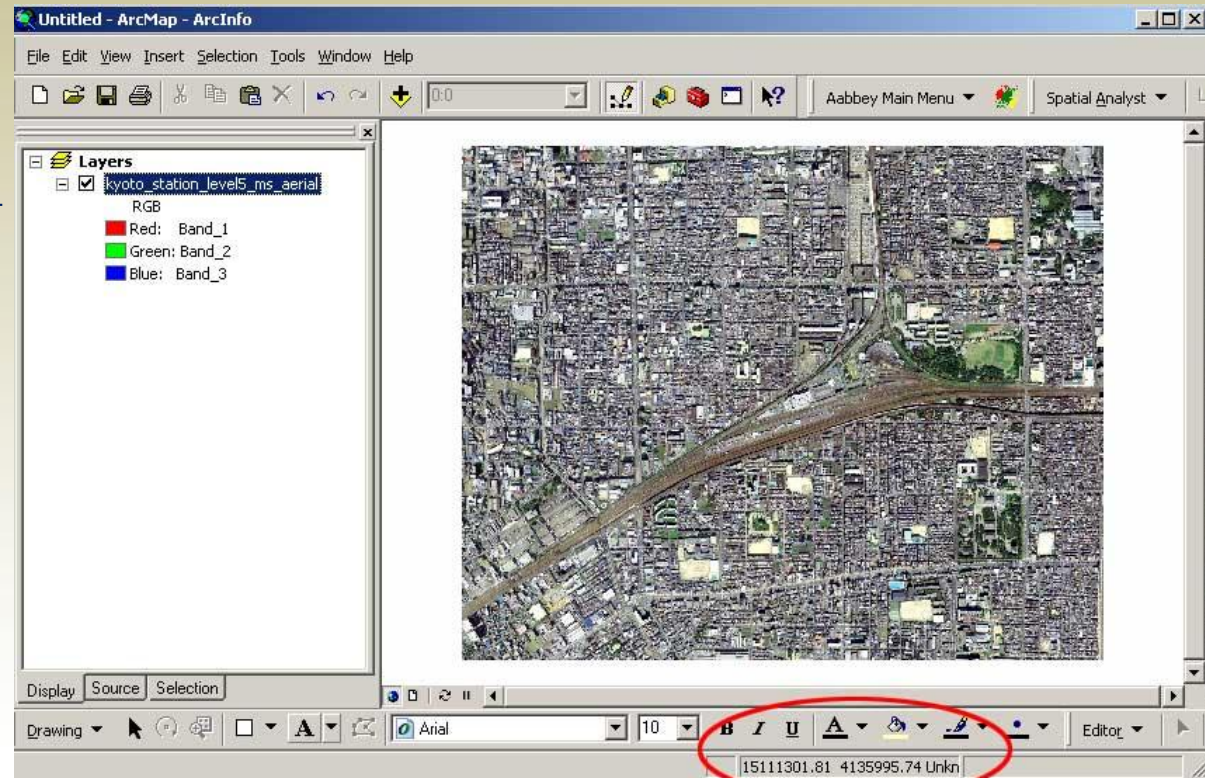


1. Start an edit session (start editing).
2. Choose which layer within your workspace you want to be the target layer.
3. Choose whether you want to create new features or edit existing ones.
4. Set up additional properties or options, such as turning on snapping, setting which layers are selectable, 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.

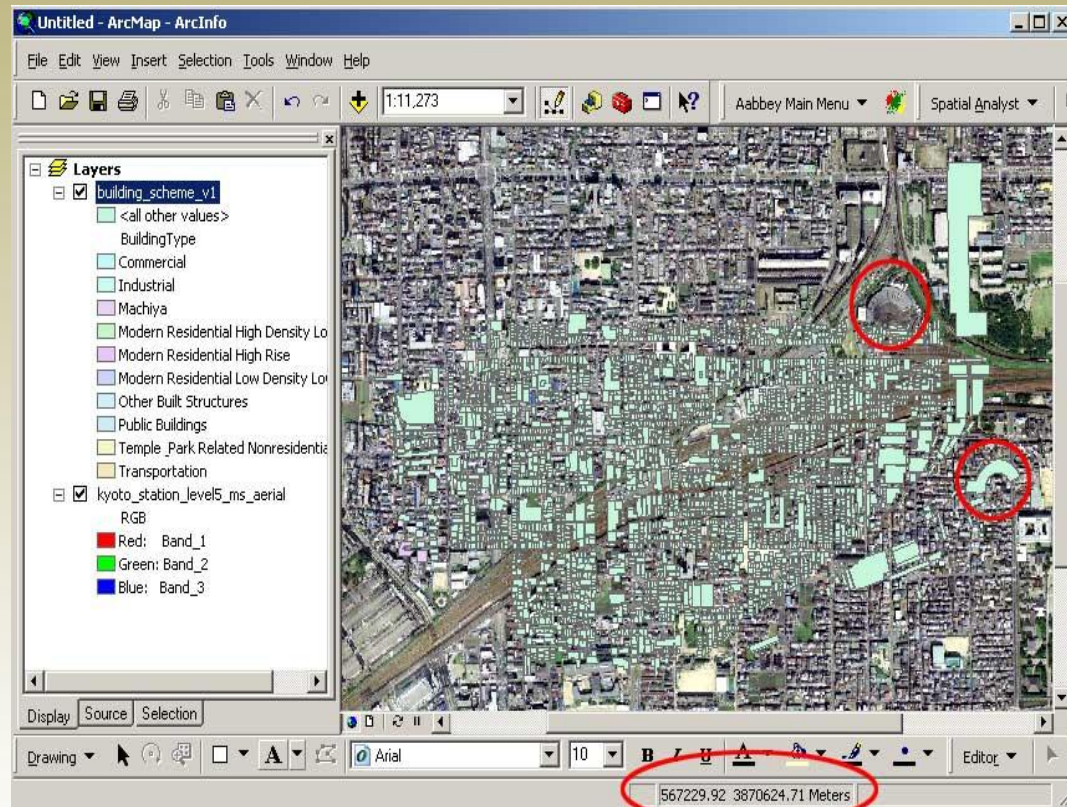
Case 2: Digitizing Unprojected images

- 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

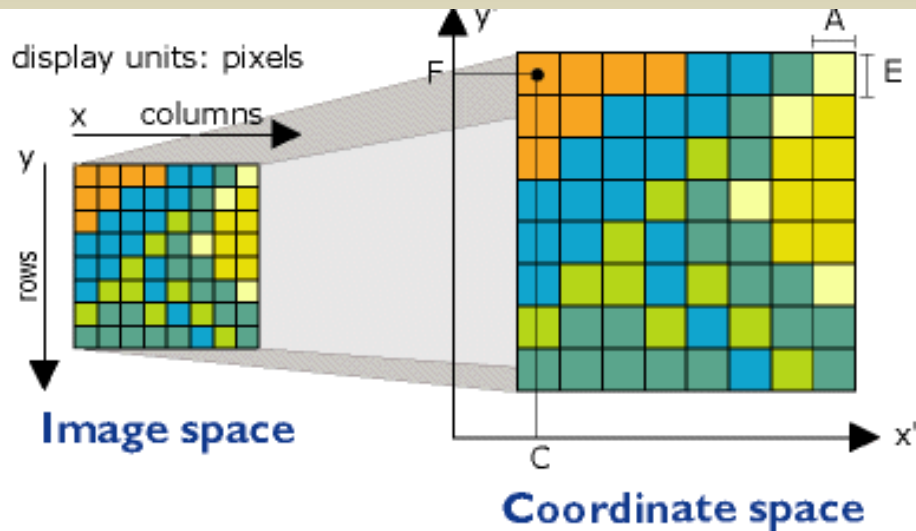


Now we have a valid coordinate system, but our image is clearly pretty far from being correctly registered.

Georeferencing

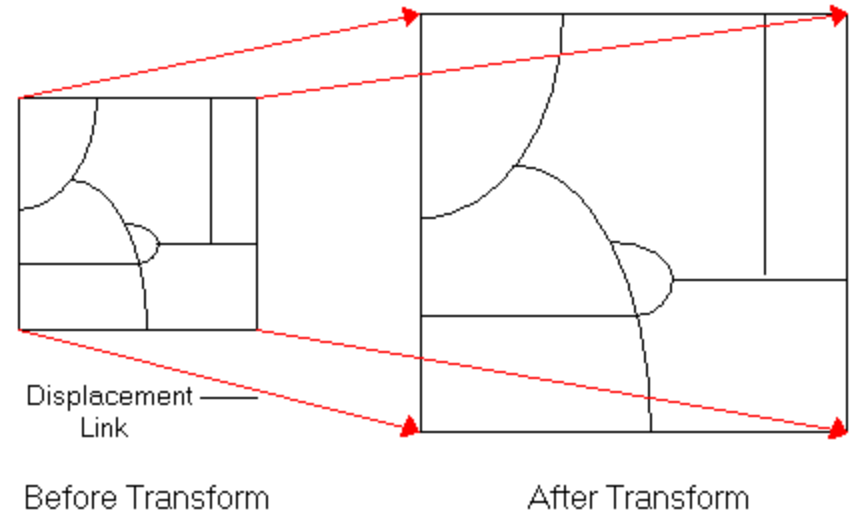
Georeferencing

align, or georeference **raster** datasets.



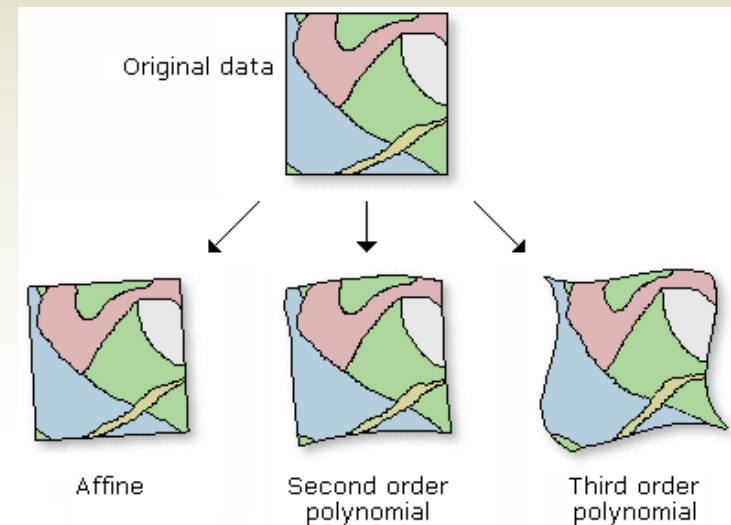
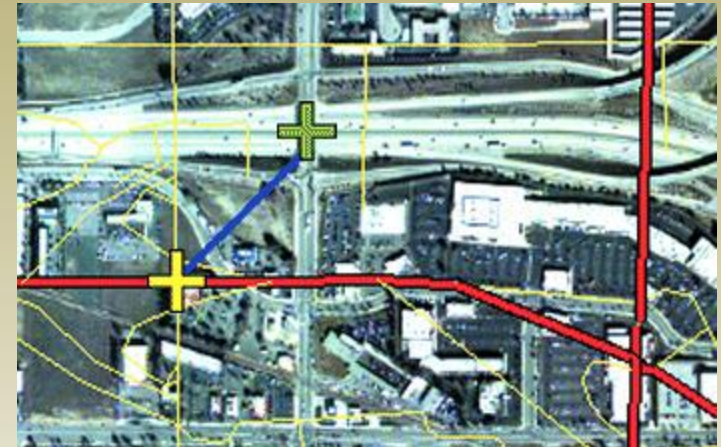
Spatial adjustment

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



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.



An example of spatial adjustment

The screenshot shows the ArcMap interface with the following components:

- Layers Panel:** Lists layers including 'eastma_major_rd', 'cambbgrp', 'newpolys', and 'Massachusetts Data from MassGIS (GeoS)'. The 'newpolys' layer is currently selected.
- Spatial Adjustment Dialog:** A floating window titled 'Spatial Adjustment' with a toolbar containing various alignment tools like 'Snap', 'Move', 'Scale', and 'Stretch'.
- Link Table Dialog:** A dialog box showing a table of coordinate pairs for linking source and destination features.

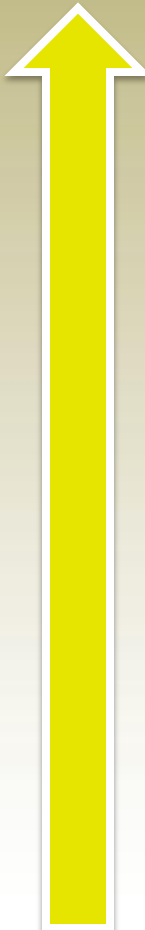
ID	X Source	Y Source	X Destination	Y Destination
1	-7914699.197...	5215259.060659	-7914773.561...	5215341
2	-7914752.034...	5215216.007702	-7914812.700...	5215294
3	-7914797.044...	5215075.107116	-7914838.140...	5215131
4	-7914900.763...	5215043.795875	-7914914.461...	5215094

RMS Error: 11.035430



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

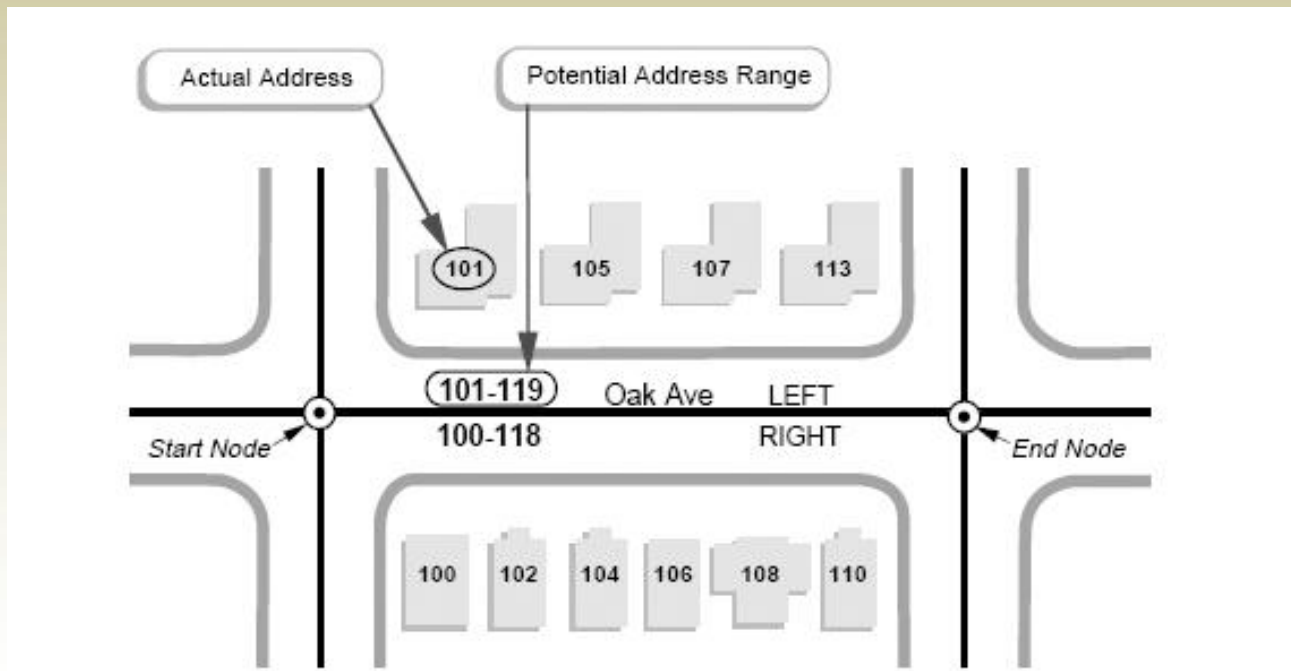


Geocoding

- **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

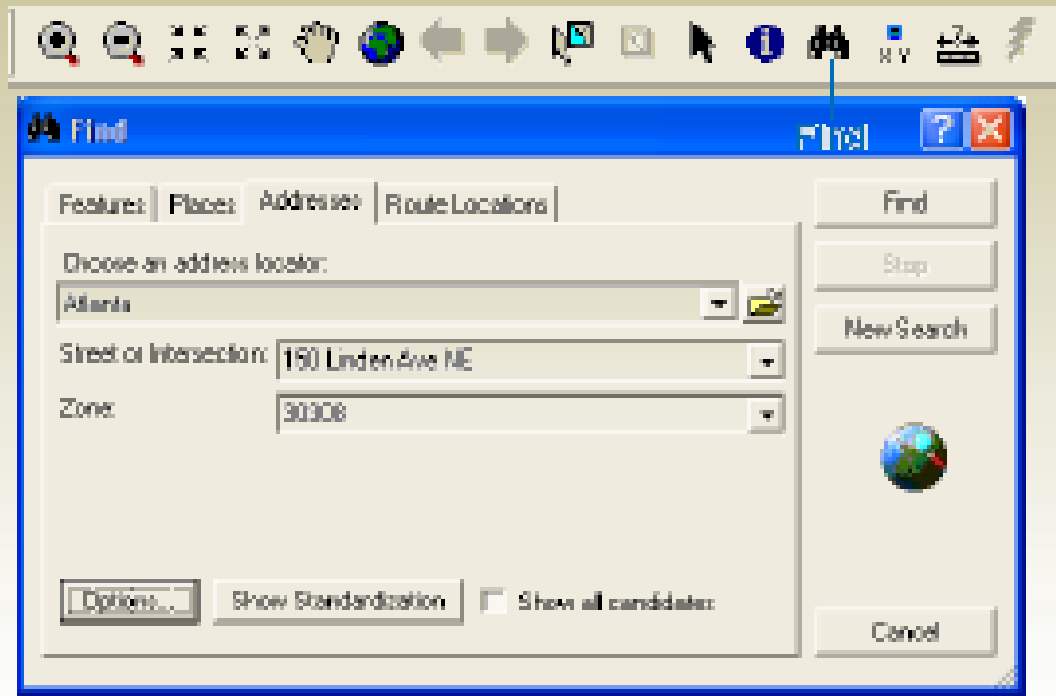
- Data needed for geocoding:
 - A list of addresses saved as a database or a text file
 - Street centerlines with street names and address ranges on both sides of streets.



- 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)



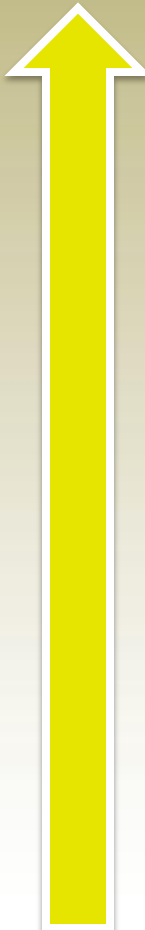
- Googlecode

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



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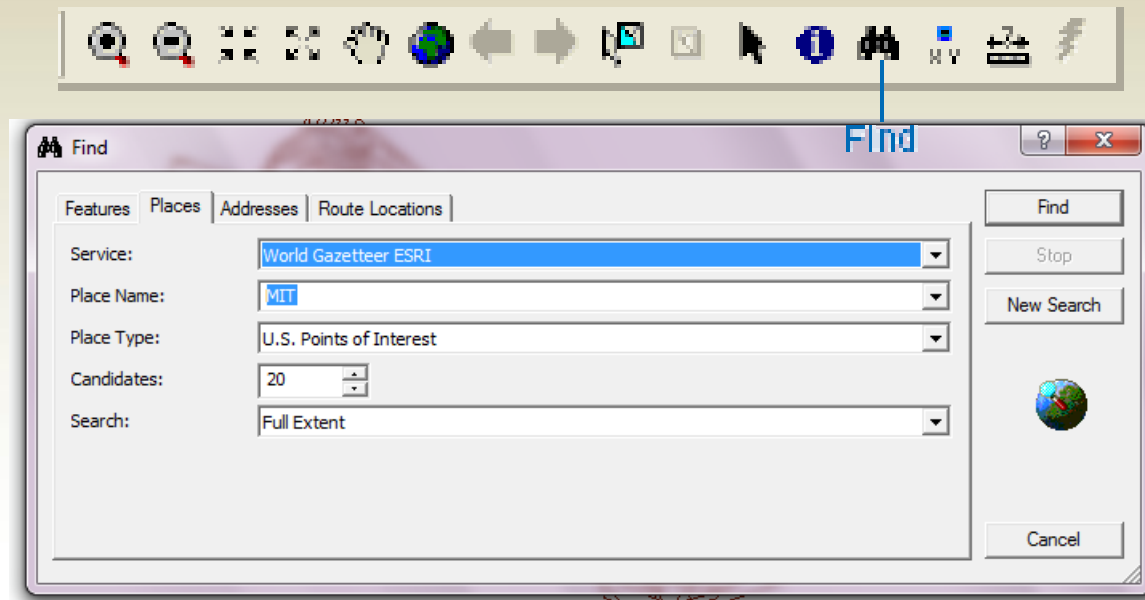
XY coordinates (or Z, or Time)

More precise

Data formats

Look up place names in Gazetteer

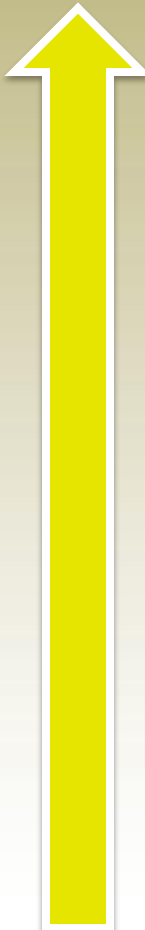
- **A place name**—One or more keywords that can be used to search for a place (e.g., a country, city, river, or any geographic feature).
- **A description of the place**—A statement clearly identifying the place.





Geospatial data in a broader sense

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Imagery

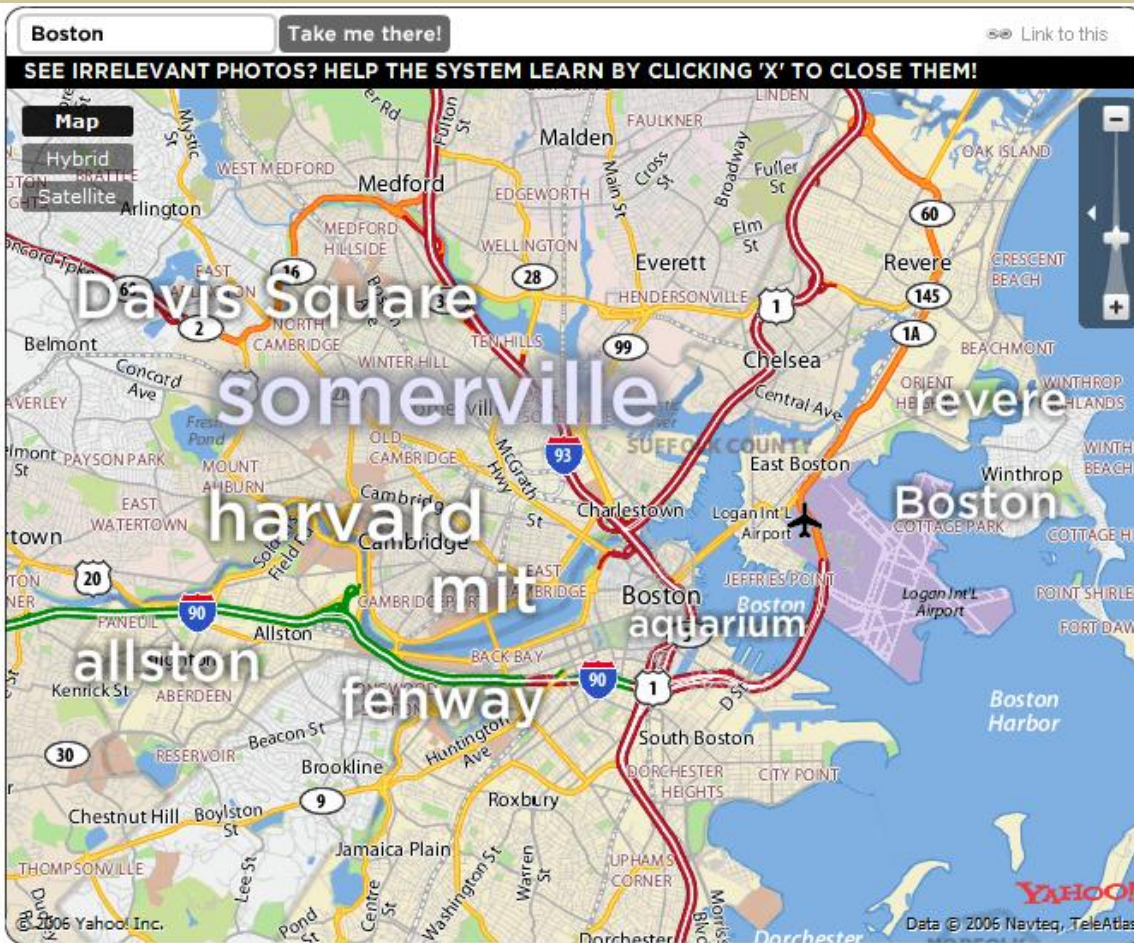
XY coordinates (or Z, or Time)

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.



See irrelevant photos? Help the system learn by clicking 'x' to close them!

