Geocoding & Spatial Analysis

GIS Workshop: Part 2

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What is GIS?

"A system of hardware, software and procedure to support the <u>capture</u>, <u>management</u>, <u>manipulation</u>, <u>analysis</u>, <u>modeling</u>, and <u>display</u> spatially referenced data to solve complex problems and management plans."

From Dr. K Curtin (GGS 553, GMU)

Introductory GIS: Review

•What is a geospatial data?

•Two types of data models: Vector vs Raster

•Projections

•Exercise: Creating a thematic (Choropleth) map: an exploratory data analysis (visualization of data (based on geographical observation unit, Census Tract) to generate a pattern and generate possible hypotheses or modeling). One way of spatial Analysis.

Spatial Analysis

- A process of examining the locations, attributes, and relationships of features in spatial data through overlay and other analytical techniques such as spatial statistics or a set of techniques (descriptive spatial statistics, spatial regression, spatial interpolation).

- Distance and local effects (a possibility of spatial dependence or proximity) offer some explanation.

Examples of Spatial Analysis

- What is the nearest grocery shop from here?

- How many customers are coming within 5 miles (or 10 miles) from this location?

- What would be the best locations given the criteria?

- How distance affects the consumers' behavior to choose a particular location given multiple shopping centers?   More…

Part 2 GIS Workshop-Coverage

Geocoding and Basic Tools for Spatial Analysis

- **Geocoding** (creating a feature class from a table of address data)—visualize a spatial point pattern.

- **Geoprocessing**: Clip, buffer, Intersect, Dissolve, summary statistics

- **Spatial Join** (Join two tables based on spatial proximity of locations)

- **Nearest Distance Matrix Generation**

Geoprocessing

A framework of data transformation: ranges from converting from one format to anther format, projection, polygon overlays, creating a buffer zone to complex regression analysis through automated tools (see various tools from ArcGISToolbox)

Original data sets→ create a new dataset for your research interest via special processing tools
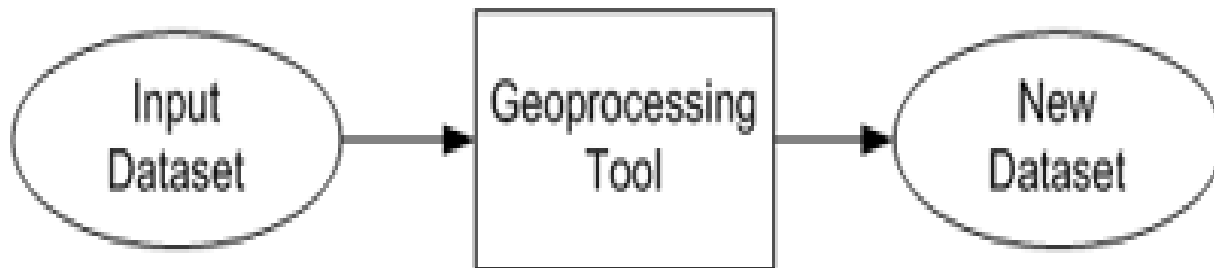
Exercising Project

- Identify a location for a new Japanese Restaurant in Fairfax County, VA through a series of exercises.

Data:

Download via Library Geodata Server:

(Address data for Jap. Restaurant, FX County Street Data,

Fairfax County Census Tract Boundary File,

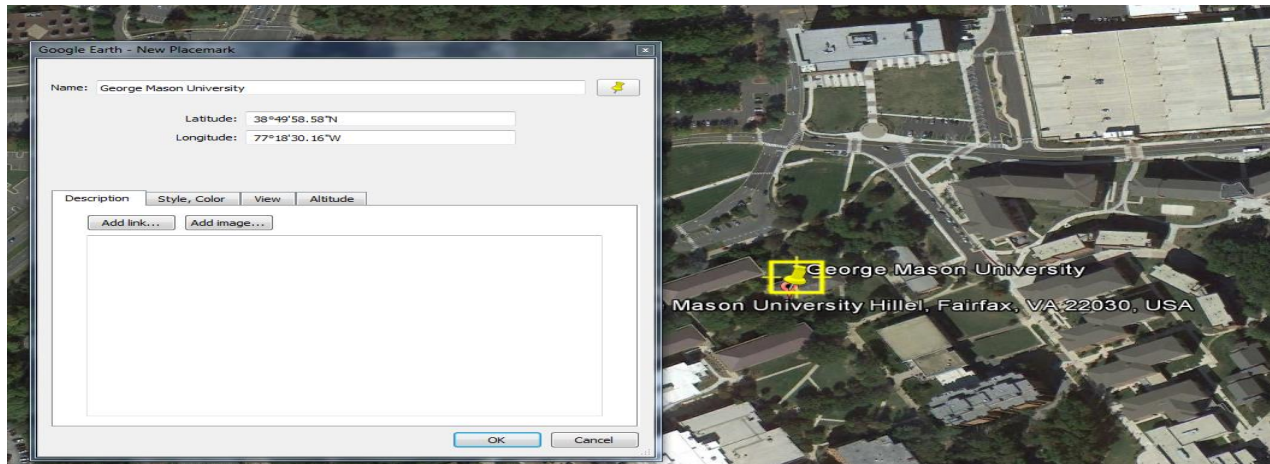& Population data in Fairfax County Census Tract)

Tools : Geocoding, Clip, Buffer, Intersect, Dissolve, and Summary Statistics.

Geocoding in GIS

ADDRESS	CITY	STATE	ZIP CODE
115 MALL DRIVE	HANFORD	CA	93230
372 WEST CYPRESS AVENUE	REEDLEY	CA	93654
1141 ROSE AVENUE	SELMA	CA	93662
1111 WEST LA PALMA AVENUE	ANAHEIM	CA	92801
1411 EAST 31ST STREET	OAKLAND	CA	94602
15400 FOOTHILL BOULEVARD	SAN LEANDRO	CA	94578
2070 CLINTON	ALAMEDA	CA	94501
2401 BLANDING AVENUE	ALAMEDA	CA	94501
625 WILLOW STREET	ALAMEDA	CA	94501
100 SOUTH RAYMOND AVENUE	ALHAMBRA	CA	91801
2450 ASHBY STREET	BERKELEY	CA	94705
2001 DWIGHT WAY	BERKELEY	CA	94704
350 HAWTHORNE AVENUE	OAKLAND		
3100 SUMMIT STREET	OAKLAND		
2655 ALVARADO ROAD			

GEOCODE

Latitude: 45.56457
Longitude: -122.62960

In reality, hard to find XY Coordinates of a location unless using a tool such as below :

Google Earth - New Placemark

Name: George Mason University

Latitude: 38°49'58.58"N
Longitude: 77°18'30.16"W

Description | Style, Color | View | Altitude

Add link... | Add image...

OK | Cancel

George Mason University
Mason University Hillel, Fairfax, VA 22030, USA

Geocoding

- The process of locating a list of addresses on Network database or converting a table data to a feature (a point shp file)

<u>Step 1:</u> Address Data with Japanese Restaurant & Fairfax County Street Data

Bring the Fairfax County Census Tract shape file and create a thematic map based on total population variable for next procedure

Common Analysis Tools

- **CLIP**: select input features that fall into the clip features (called "cookie cut" or "trim")
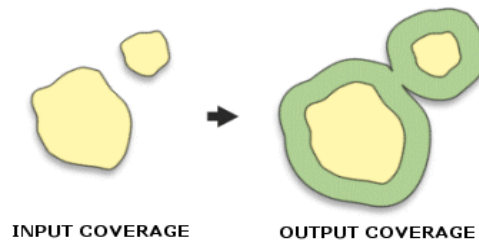

INPUT   CLIP FEATURE   OUTPUT
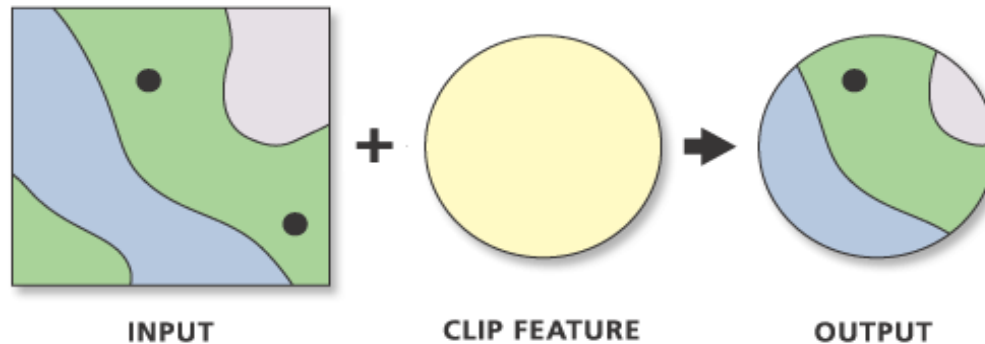
<u>Step 2</u>: Select all restaurants falling inside of

Fairfax County Boundary

Data: Restaurant shape file, FX County Census Tract Boundary File)

Common Analysis Tools

- **Buffer**: Create a buffer zone based on a certain distance around a specified input feature

INPUT COVERAGE   OUTPUT COVERAGE

Step3 : create a buffer zone with a distance(1.5 miles) around each restaurant to see which census tract areas will be affected (delineate a market or service area) and try also create a multi-ring buffer (Analysis>Proximity>Multi-Ring Buffer)

Data: Fairfax County Census Tract boundary file/Restaurant data shape file

Common Analysis Tools

- **INTERSET**: extract features or portions of features that overlap each other between two features (polygons), then make a new layer ("AND" operation).
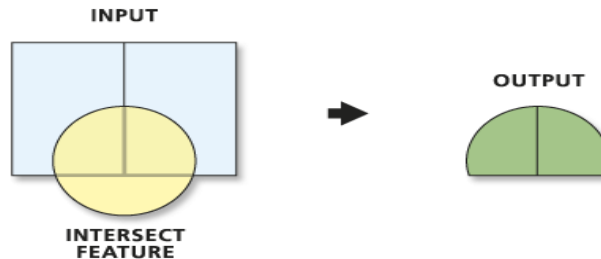

Step 4: Identify the census tracts falling in the buffer zone areas visually along with a combined attribute table.

Data: FX census tract boundary file with population data / a buffer layer created from the step 3 exercise)

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Common Analysis Tools

- **DISSOLVE**: create a group of features based on a common attribute value into one feature. Allows adding statistical fields by adding a new column such as "SUM"

INPUT COVERAGE → OUTPUT COVERAGE
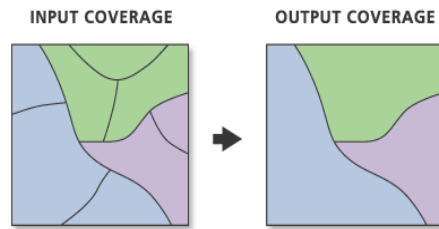
Step 5: find a group features (Census Tracts) from the created buffer zone that share the Restaurant name and count all population that fall into each group (Generate a market size for each restaurant)

Data: FX census tract boundary file with population data / the Interset layer

Spatial Join Exercise

- **Spatial Join :** join two tables based on spatial location (Overlay Analysis)

Exercise : Convert a XY data into a point pattern data and overlay them with another spatial layer, and calculate a total incidences falling in each census tracts.

(Join> data from another layer based on spatial location)

Data: download "data for spatial join exercise" from the server.

Note: All data that you will be using should be in the same coordinate system to do "Spatial Join"

Point Density Tool

- Calculate the density of point features around each output raster cell

- Convert a point feature to a raster feature (called as a heat map)

InPts = OutRas

High : 433.054

Low : 0
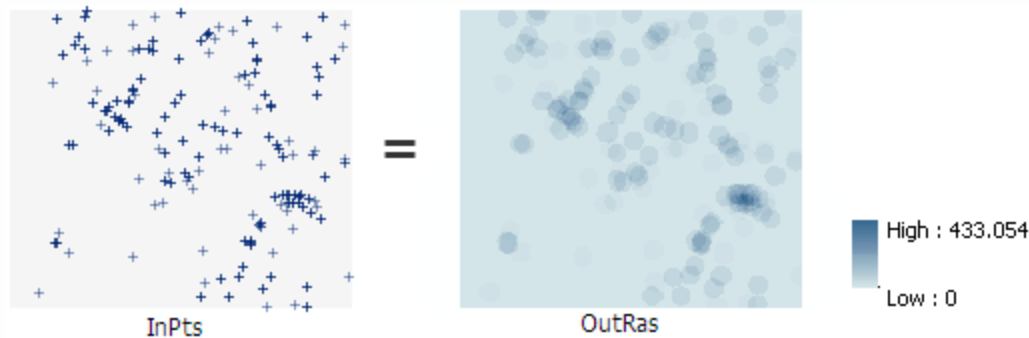
Spatial Analysis

Using "Selection" tool to identify locations for your criteria.

- ## Selection by Location

<u>Exercise 6</u>: Identify the Census Tracts that are 2 miles away from the existing Jap. Restaurants (Identify possible market area for a future Jap. Restaurant)

- ## Selection by Attribute

<u>Exercise 7</u>: Identify the Census Tracts that are with population > 2000 (Recommend a best area to locate a new Jap. Restaurant)

Creating a Distance Matrix/Proximity Analysis

- What is the straight distance between all points in a layer? (identify the closest facility location (s) from a location)

Data: FX restaurant location data

   (Arctool bar>Analysis tools>Proximity>generate near)

Note: Import the file to excel and "transpose" it to show a horizontal way for further analysis

Contact & URLs

For more information, please contact:
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Libraries Geodata Server- http://librarygeodata.gmu.edu
Infoguide on GIS- http://infoguides.gmu.edu/geospatial