GEOG 176 A
2015 Fall

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Lab 5: Networks

DUE:
2 p.m. Wednesday Nov 11th 2015
(Two weeks)
Introduction to Network

• Type of network

social

computer

electrical

neural
Introduction to Network

• Elements of networks

- **Vertex**: connection point
- **Edges**: connect one vertex to another vertex

These elements determine network *connectivity*. 
Introduction to Network

• What are Network Datasets?
  
  • they describe movement along a route
  • they can model transportation networks
  • they are created from points and lines
  • they do not contain geometry, but they reference point and line shapefiles
Introduction to Network

• What questions can network datasets answer?
  • Routing
    What is the fastest route between my house and my job?
  • Closest facility
    Which grocery store is closest to my house?
  • Service network
    Where should I move so I can live within a 10 minute drive of the beach?
  • Origin-destination
    Will biking to campus during the day take longer than biking back to my house in the evening?
Impedance

• Impedance is a factor of *resistance* (i.e. scaled cost)

  • A value $> 1$ will slow down relative travel
  • A value $< 1$ will speed up relative travel
  • Designating a score of 4 is obtained from biking ($\sim 10 \text{ mph}$), which is about four times faster than walking ($\sim 2.5 \text{ mph}$)

Impedance could be set on both *distance* and *time*!
Impedance

- impedance == scaled cost
- What would result in a scaled cost of 5? (terrain, road block)
Service Area

• A network service area is a region that encompasses all streets that can be accessed within a given distance or travel time from one or more facilities.

• Service areas are commonly used to visualize and measure accessibility.
What hospitals are within a 3 minute, 5 minute and 10 minute drive time of my house, given the street network?
Pre-lab Task

Go to GauchoSpace and open PDF for Lab 5

- Download and extract data (geodatabase)
- Open ArcMap
- Turn on Network Analyst extension
- Add Network Analyst toolbar to menu
What is a geodatabase?

• Think of it as a *container* for data...
Objectives

• Through this lab, you will gain a deeper understanding of the concept of a network by experimenting with network data in the key application area of wayfinding.
Beginning ArcMap

• Download the geodatabase
• Unzip it
• Move it to your working folder
• Connect to your folder
• Drag the data to Layers
Question 1

- Zoom to buildings layer (right click)
- Drag pedways and cycleways to the top of Layers
- Add a basemap of imagery
Question 1

• Right click on a layer to open its attribute table
• To sort by column header, double click header
• Highlight a record to highlight a feature
Question 1

- Summarize the layer by right clicking on column header
- field to summarize: highway
- sum of Shape_Length as summary statistic
- save as dBASE (.dbf)
Question 2a

- Customize > Extensions > turn on Network Analyst
- Customize > Toolbars > Network Analyst
- Open Network Analyst Window
Question 2a

- Network Analyst > New Route
- Select “Stops”
- Drop origin point
- Drop destination point
- Open Layer Properties
Question 2b

- Once you set properties, solve
- Run a second time with time as impedance
- Open route attribute table
Question 2c

- Identify line segments from “bicycle_nd_roads”
- This opens the attributes for the selected feature
Question 3a

• Impedance is a factor of resistance (i.e. scaled cost)
• A value > 1 will slow relative travel
• A value < 1 will speed relative travel
• Designating a score of 4 is obtained from biking (~10 mph), which is about four times faster than walking (~2.5 mph)
Question 3a

• Drag pedways to the Scaled Cost panel
• Specify a value of 4
• Solve
Question 3b

Diagram showing:
- Origin and destination points.
- A curved line connecting the two points.
- A section labeled '10 meters, scaled cost = 5'.
- A section labeled '40 meters, no scaled cost'.
Question 4a

- Click on directions button
- Step through directions in map by clicking on blue links
Question 4b

- Pay attention to the restrictions settings
- Solve again and compare turn by turn
Question 5a

- New Service Area
- Layer Properties > Analysis Settings
- 4, 6, 8... min
Question 5a

- Select features by rectangle
- Click on your building
- Zoom out to see the selected polygon
Question 5b

- New Service Area
- Layer Properties > Analysis Settings
- 2 origin points