
# GIS 5572
# Cole
# Anderson

# Problem

- Distance is not the only movement concern for pedestrians with mobility difficulties. A short distance with a steep slope will take as much energy as a long distance gradual slope. Create a code interface that finds the route with the lowest total “energy” cost between any two network points for eventual web app integration.

# Data

- MN GeoSpatial Commons Road Centerlines (GACS)
  - Includes roadlines for Anoka, Carver, Chisago, Dakota, Hennepin, Isanti, Ramsey, Sott, Sherburne and Washington counties.
  - NAD83 UTM 15 in meters
- MN Geospatial Commons Minnesota Digital Elevation Model: 30m
  - USGS 1:24000 Level 2 DEM
  - NAD83 UTM 15 in feet (vert.) and meters (horiz.)

# Methods: 1

**Data Retrieval**

**Create feature dataset**

**GDB Import**

**Find street elevations from DEM**

- arcpy.AddSurfaceInformation
- Zmax & Zmin

**Standardize Units**

- Convert roadlines from meters to feet
- CalculateField_management

**Find Slope & Energy Cost**

- Slope = (Zmax-Zmin)/Leng_FT
- Energy = Slope*Leng_FT

# Methods: 2

**Create Network and Travel Mode**

- arcpy.na.CreateNetworkDataset
- Travel Mode: use Energy for impedance

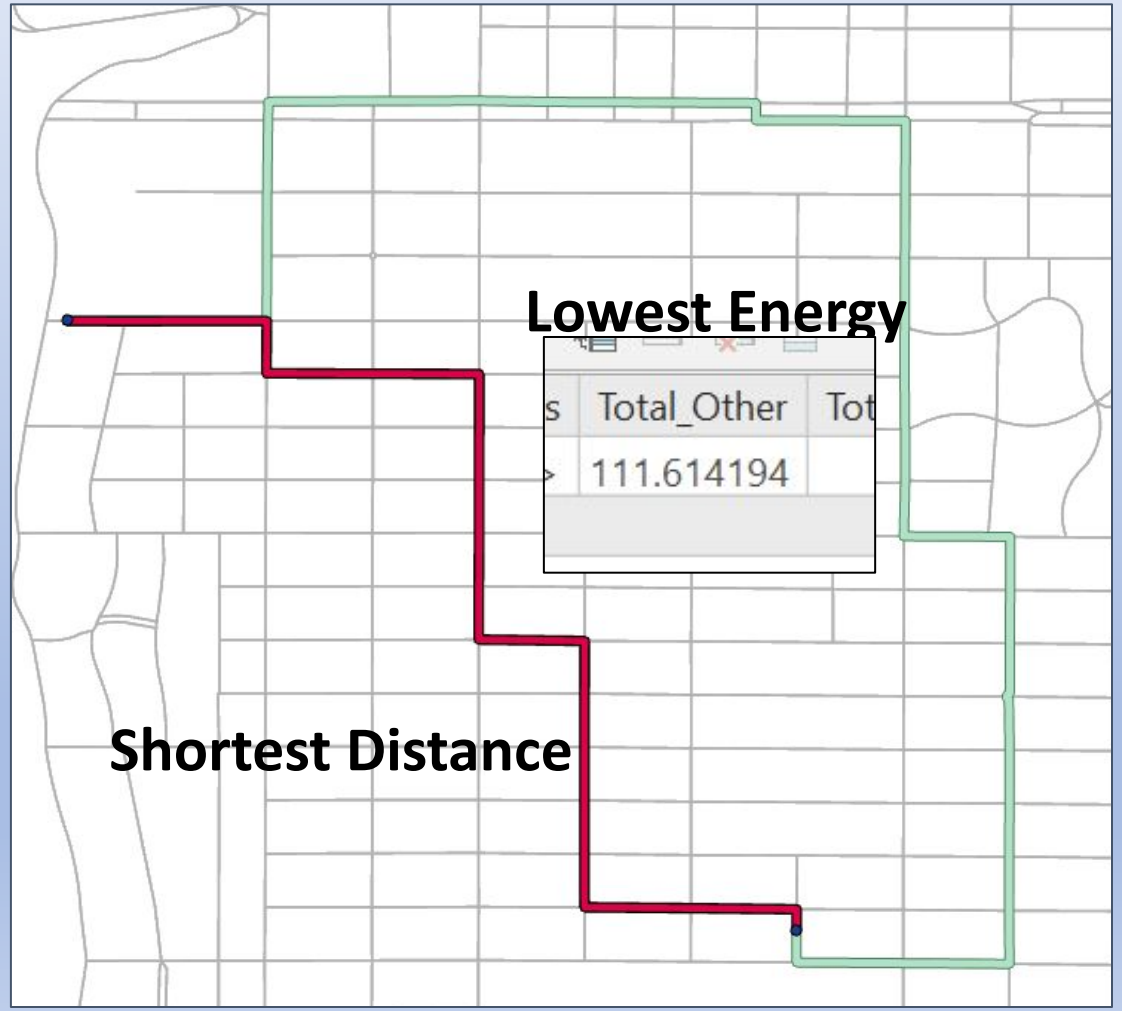
**Create layer with start/end points**

- Cursor inserts user defined points in new FC

**Route Solver**

- Create ND_layer from network
- Add input/stops layer
- Initialize arcpy.nax.Route
- Set solver properties
  - Travel Modes
  - Time/Accumulation
  - Directions
- Route.solve

# Results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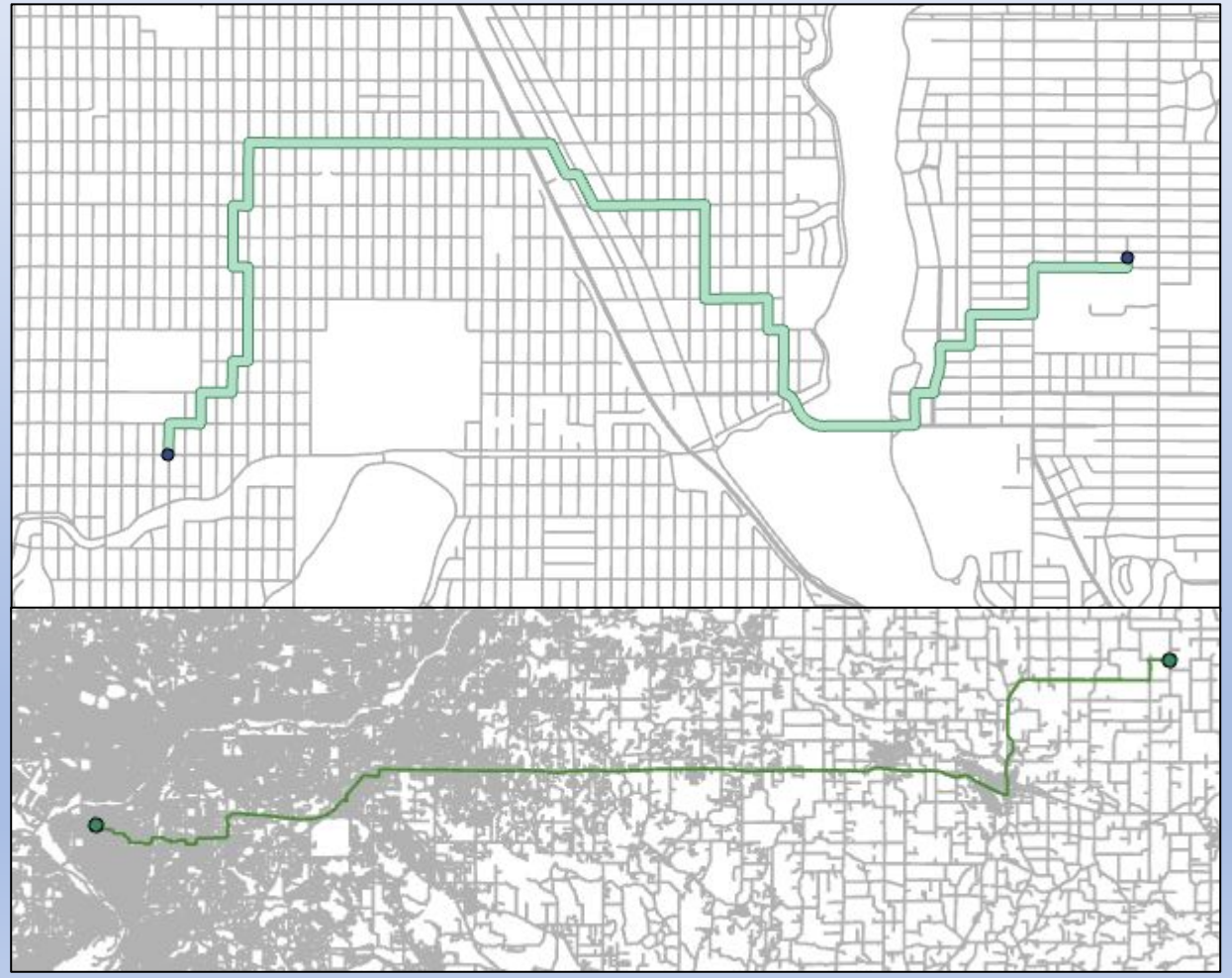

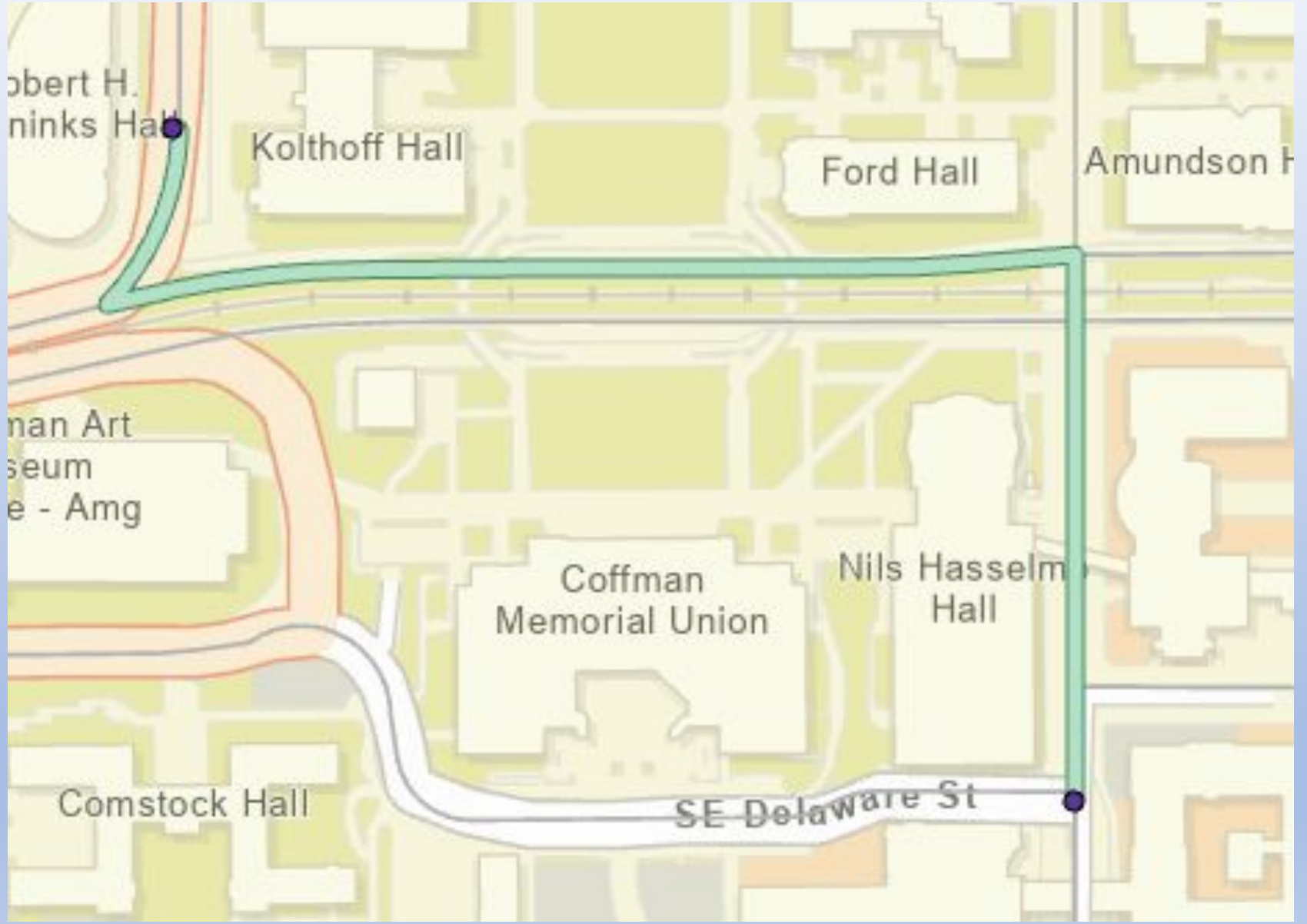
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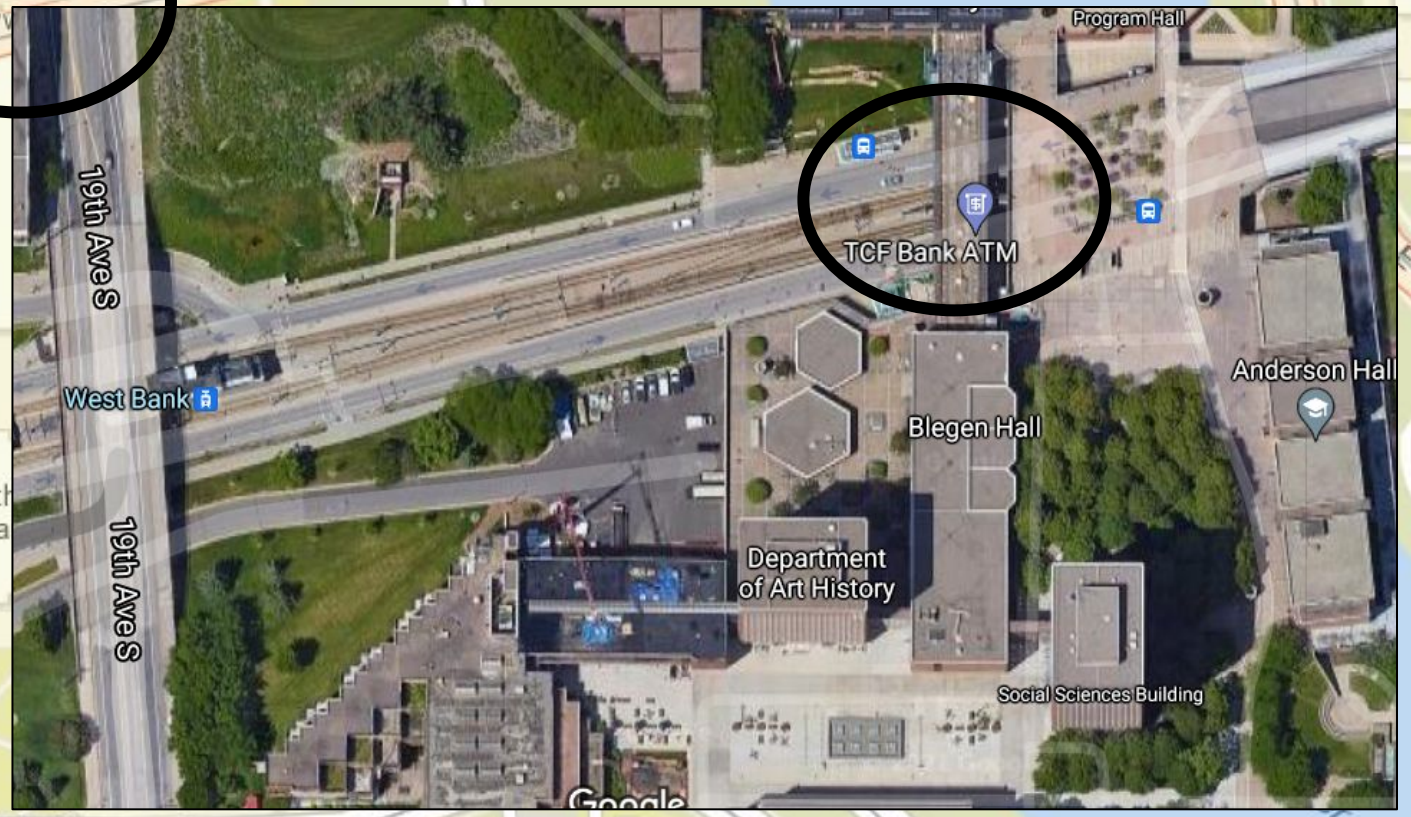


Weisman Art Museum Garage - Amg

Washington Ave Pedestrian Bridge

Willey Hall

Green-West Bank

Walter W. Heller Hall

Hubert H. Humphrey School of Public Affairs

Curtis L. Carlson School of Management

19th Avenue Parking Ramp

Cedar Ave S

Comstock

River Pkwy

# Result evaluation

- Is the algorithm delivering the LEAST ENERGY route?
  - Unsure about testing this exactly (heuristically is ok)
  - Length should be >= shortest distance route
  - Energy should be <= shortest distance route
  - 10,305.53 m (343.48 E) vs 8,418.63 m (380.12 E)
- Is this route feasible for PEDESTRIANS?
  - I.e., that last route across Washington Ave. Bridge
  - Interstate w/o sidewalks, same level (calculating as ‘car’)
    - 2000 barriers exceeded issue

# Conclusion

- Network quality is good
- Some routes are inaccurate despite correct vertical connectivity
  - We cannot assume all roads have accompanying and similar sidewalks. The algorithm is still running on only the roads, effectively a vehicle
- Uses elements of routing, ETL, table data modification
- Would like to add just a general map that shows E-cost of each street in different colors
- Can the energy formula be improved to reflect needs?