Geol 588

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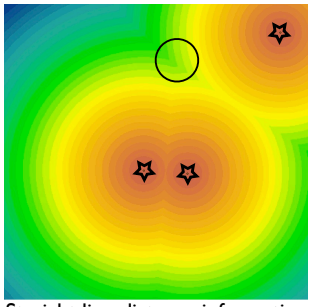
GIS for Geoscientists II

(Mar. 10, 2011)

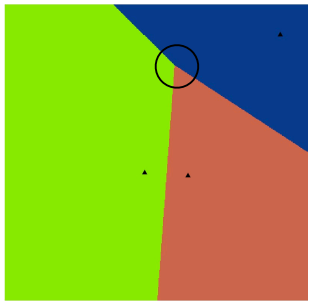
- Distances (simple and cost-based)
- Best-path exercise
- data\HW5 - Cost distance exercise

Dealing with distances

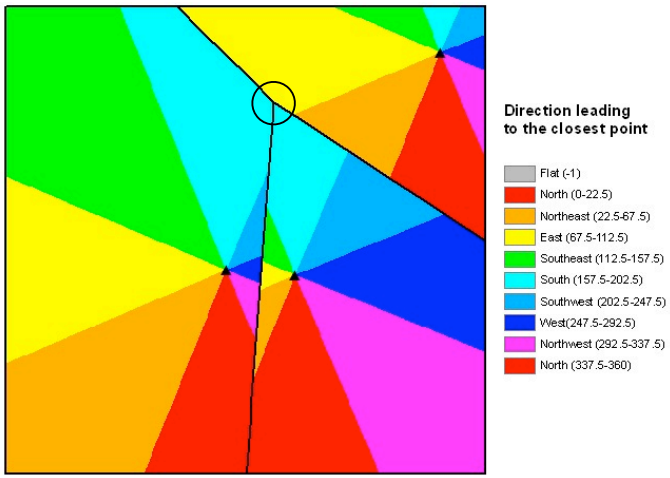
- Tools: Spatial Analyst Tools - Distance
- Two types of distance measured in ArcGIS:
  - **Euclidean** (Straight line) distance
  - **Cost** distance
- (Related: Allocation and direction info rasters)
- Euclidean (straight line distance) only based on points (here: stars) or line segments (i.e. many points)
- each cell: contains: a euclidian (real space) distance (float) to the closest point (where ever that point is!)
- it's NOT known, which (ID) of the 3 points is that closest point
- traversal cost would be 1 for each cell
- Allocation raster: Which point is the closest? (space partition)
- Thought experiment (for later):
  - imagine the distance as elevation raster (point have 0 elevation)
  - Which **path** would a drop of water at the circled location take?
  - (related to **direction** info)



Straight line distance information



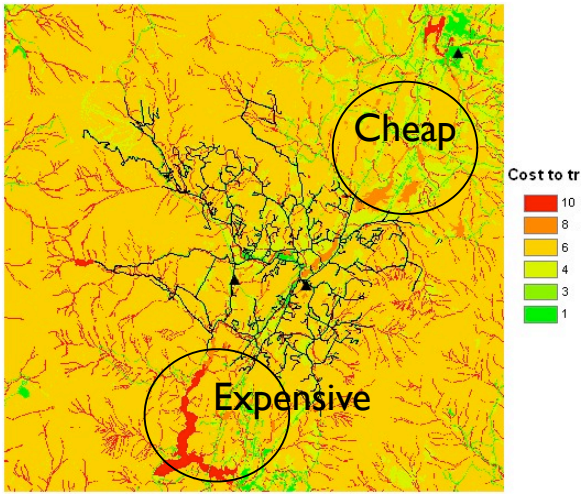
Allocation (partition) information



- Direction grid (still regarding these 3 points!)
- Each cell encodes: "the direction I need to move towards the closest point"
- Same scheme as aspect map (azimuth)

Real cost to traverse a cell

- Traversal cost raster encodes a abstract "cost" that influences the creation of a path
- Rule: to traverse this cell, you need to pay X
- Here X can be 1 - 10 (10: most expensive)
- land use (1 - 10):
  - roads (city) cost 1 (green)
  - fields cost 6 (yellow)
  - water cost 10 (red)

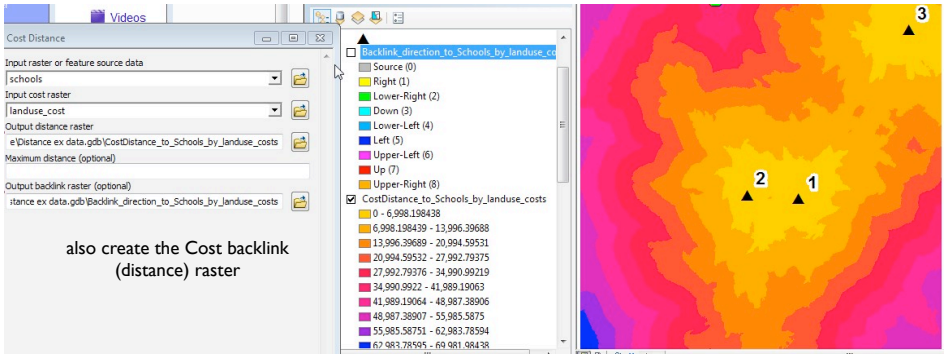


black lines: roads layer - ignore
triangles: schools (points)

Cost distance raster: How much to pay from here to get to the closest school?

Unit of cost is same as traversal cost raster (here: abstract, based on 1-10 scheme)

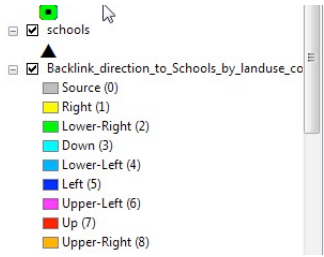
Shows the **accumulated** cost, NOT simply a "concentric" increase!

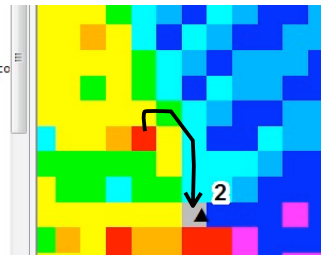


also create the Cost backlink (distance) raster

Cost Back Link Raster

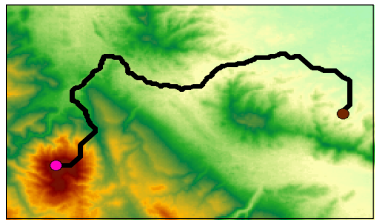
- Encodes directions
- "On current cell, which direction do I need to go to get the shortest way **back** to the source?"
- 8 possible directions
- (0 means: - you're back on the source
- needed later for *shortest path* operation
- here: grey pixel is the only source (not roads!)
- Repeat until source is hit



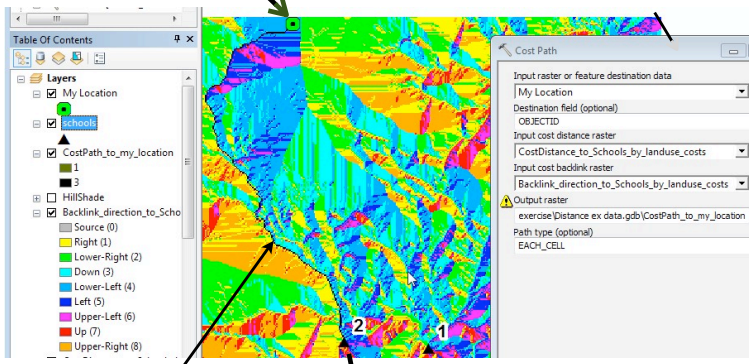


Cost path tool

- "destination" data": my location
- Destination field: gives the Value for path raster? (not sure...)
- Needs: Cost distance raster, cost backlink direction raster
- both rasters contain indirect information about **source** points (schools)
- result: shortest (cheapest) line to go from start to **any source point(s)**



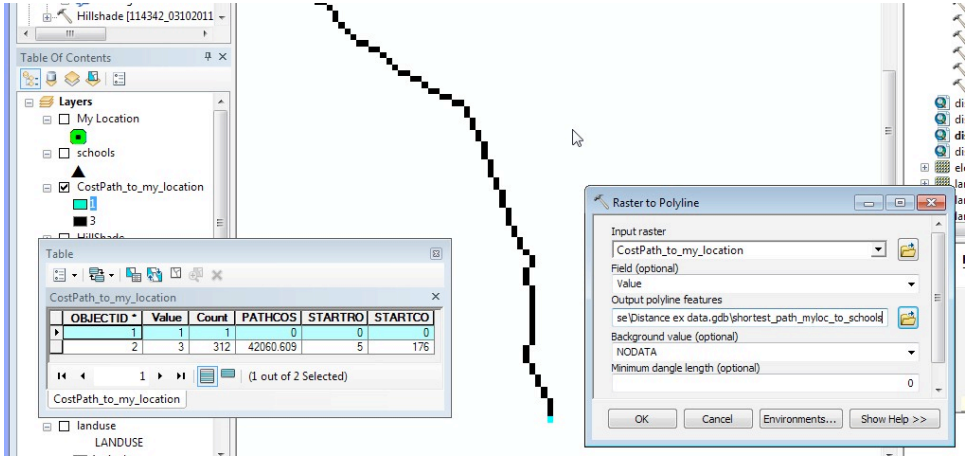
My location ("destination")



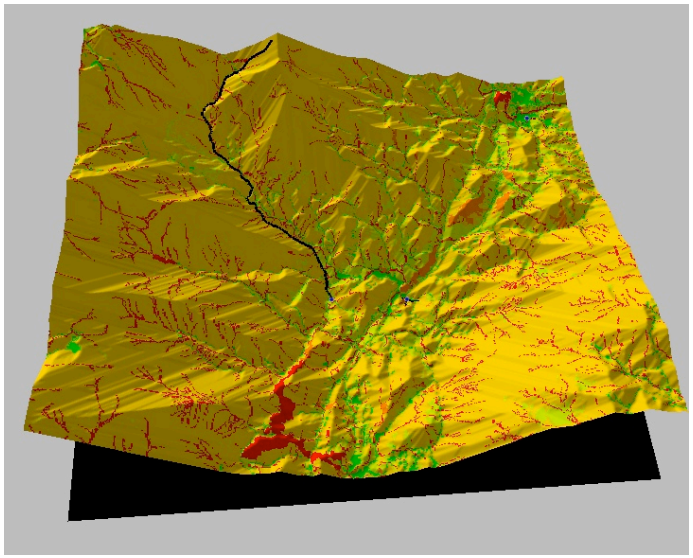
Optimal path

Closest Source (schools)

Shortest Path



- raster of optimal (shortest, cheapest) path (rest: Nodata cells)
- PATHCOST: total cost along this path
- convert path raster to line feature (didn't work for me :(



Traversal cost as "elevation"

Path as drop of water running down from destination to source

HW 5 - shortest path based on slope cost

- 1) create euclidian distance around schools

  (the rest will deal with cost distances only)

- 2) reclass the slope raster into to 1 - 10, equal intervals and use it as traversal cost raster
- 3) Create cost distance and cost backlink rasters
- 4) create cost path my location to nearest school
- 5) compare to landuse cost based path