

Geol 588

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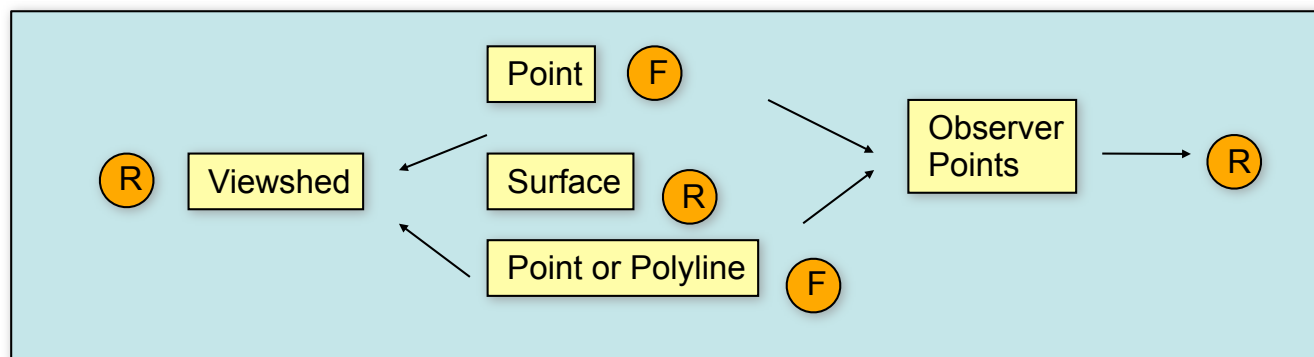
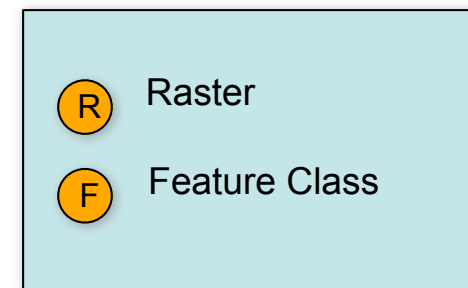
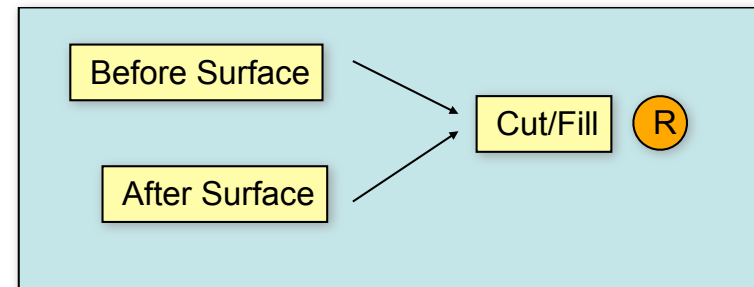
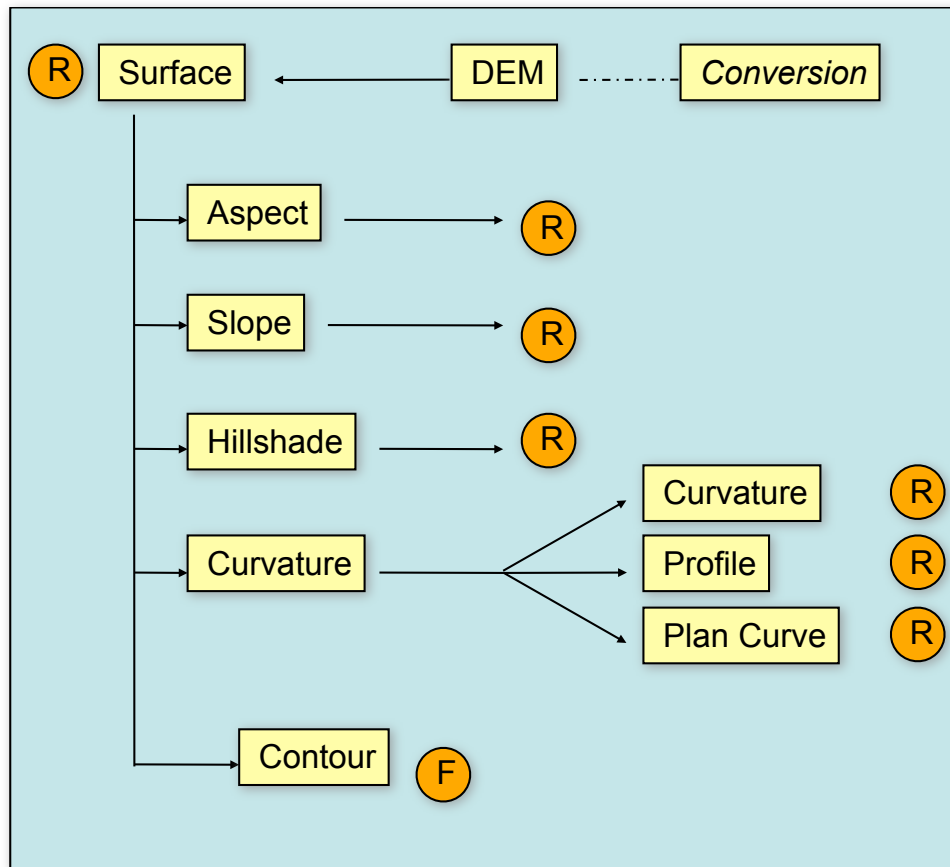
GIS for Geoscientists II

Lecture 3

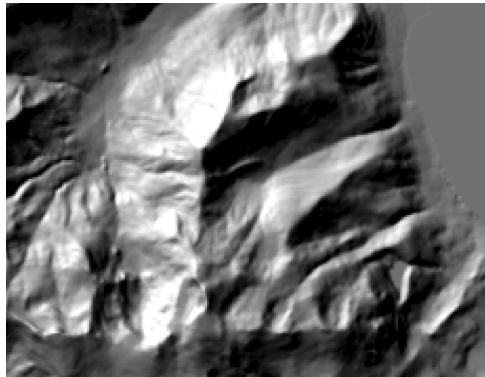
Today

- Topographic functions (surface analysis)
- Slope, Aspect, Hillshade, Viewshed
- Pause
- Help with HW assignment?

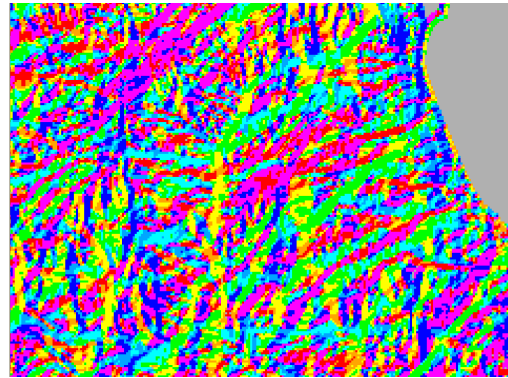
Surface analysis tools



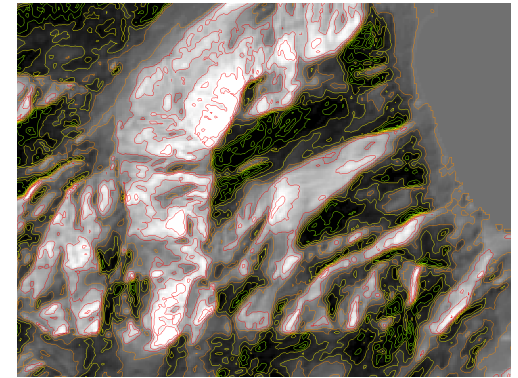
Using surfaces in ArcGIS Spatial Analyst



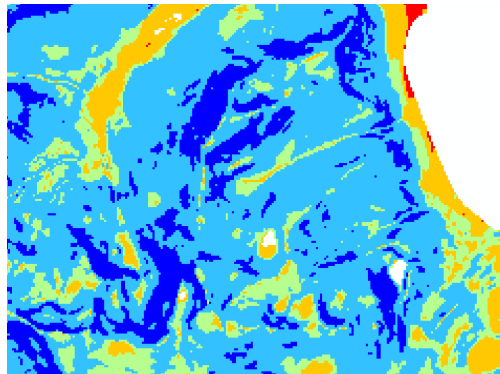
Hillshade (typically as semi transparent overlay)



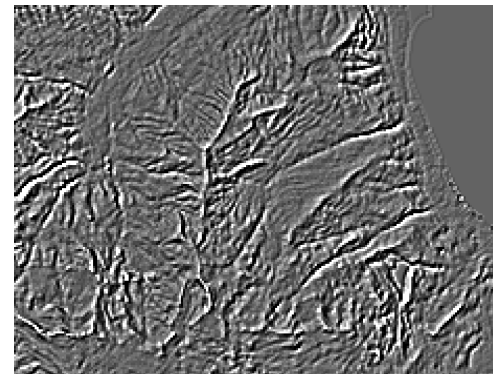
Aspect (8 different directions only)



Contour (lines)



Slope (degrees or percent, may need elevation conversion factor if elev. is in feet)

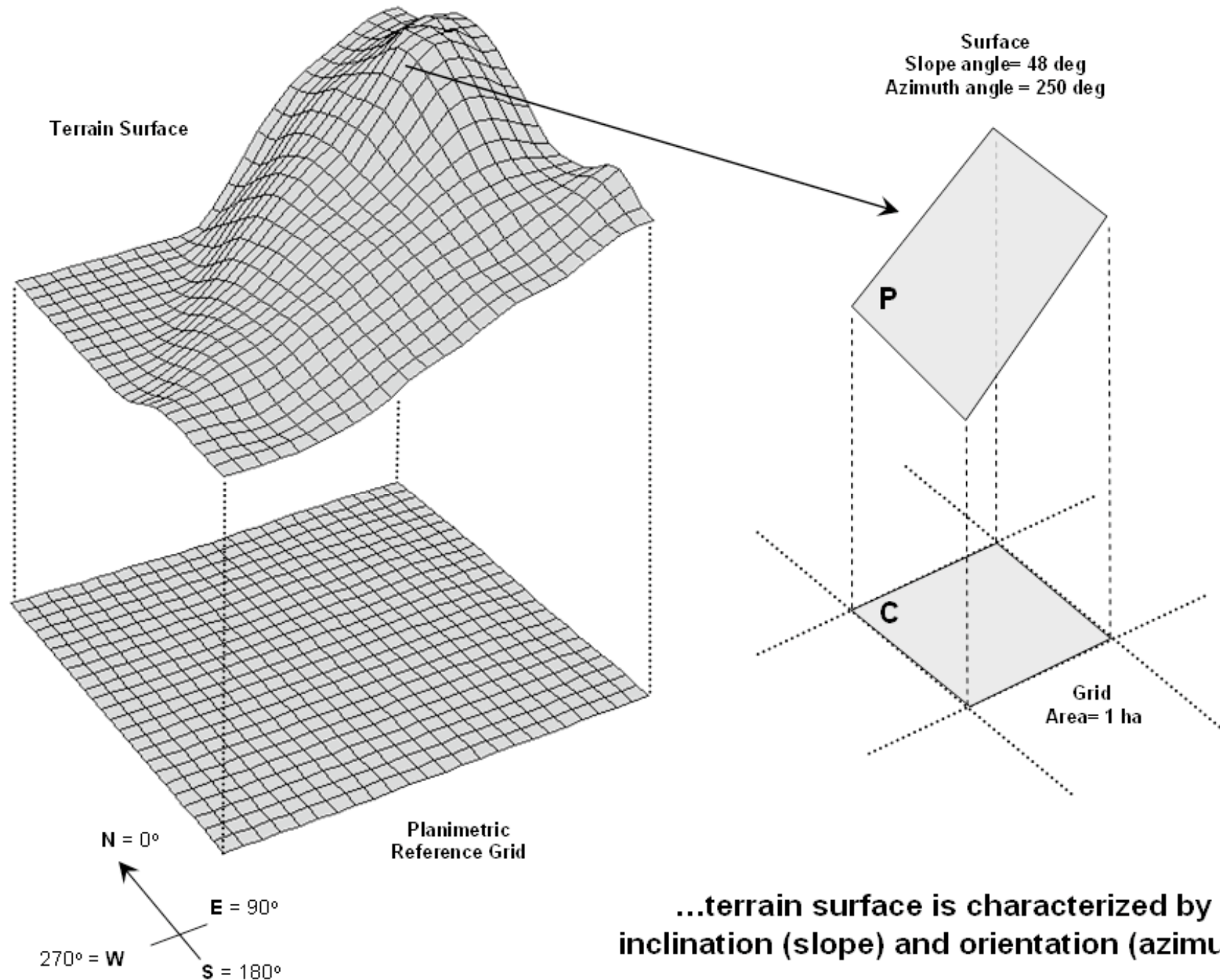


Curvature (change of slope i.e. change of change of elevation)

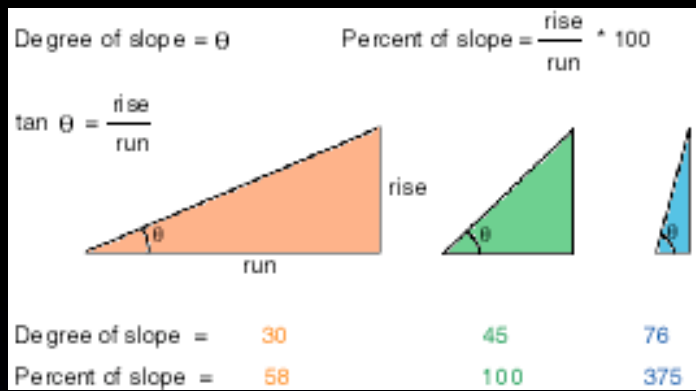
Digital Elevation Model (DEM)

- Digital Terrain Model (DTM)
- topography: Elevation (ft. or meter, sometimes: elevation in feet, horizontal distances in meters!)
- US Geological Survey:
 - 7.5' maps (quads), 10 m, 30 m; 90 m
- National Elevation Dataset (NED): 10 m
- Shuttle Radar Topography Mission (SRTM): 90 m
- raster values: large integers (1243 ft) or float (543.2 m)

Slope & Azimuth



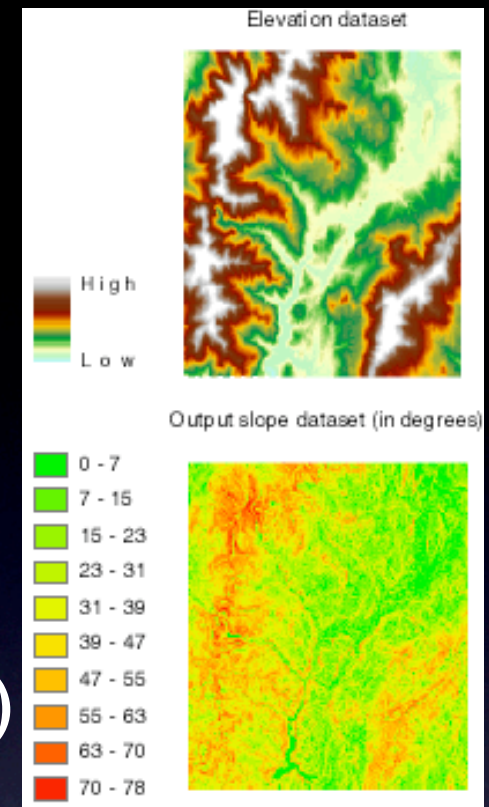
Slope



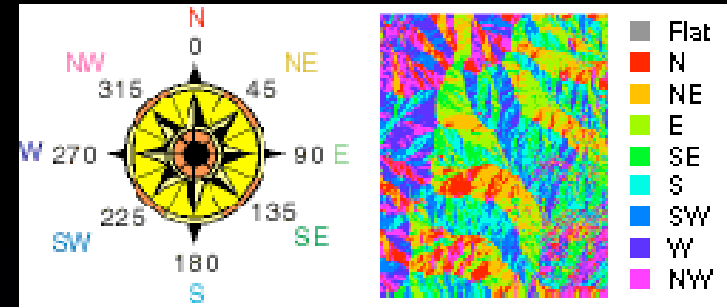
- Based on elevation difference of cell to elevation of surrounding cells
- Gradient at cell (center)
- Problem: if X/Y are in meters, elevation (Z) is in feet
- Solution: multiply elevation by 3.280 (Z-factor)
- Spatial Analyst -> Surface Analysis or ArcToolbox - Spatial Analyst tools (not TIN slope!)
- `geol588\data\mgisdata\BlackHills\rasters\dem2`

Slope

- How to symbolize?
- Properties - Symbology: Classified vs Stretch
- Apply a color ramp from elevation A (1230 ft) to elevation B (1423 ft)
- Gotcha: A and B are not always min and max !
- Types of Stretch: Standard deviations (2 sigma default), user sets min & max, none (data min & max)
- Select color ramp by name (right-click - Graphic View)
- New in 9.2: pick same color map as other layer

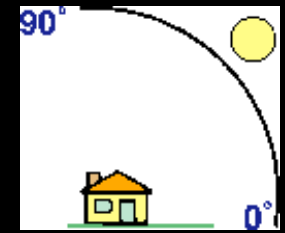
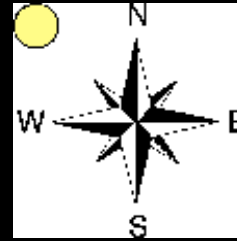


Aspect

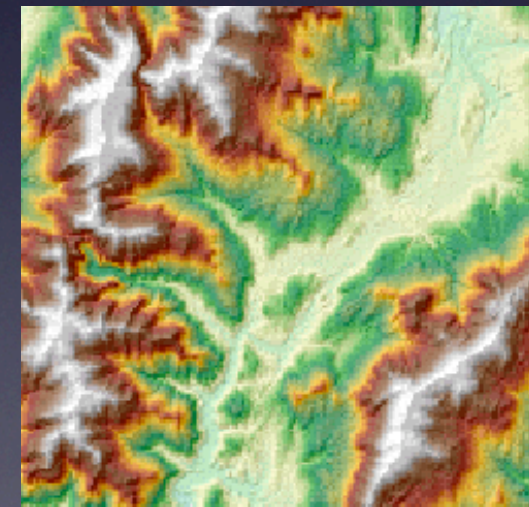
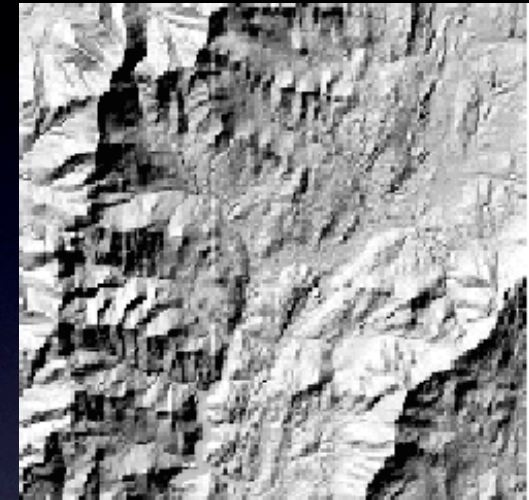


- direction of cell center, when looking down towards max. (!) slope
- in degrees (0 - 360) from North, *circular* data type
- flat areas (i.e., no slope): encoded as -1
- Problem: How to effectively convey direction?
- Looks like “3D” slopes (similar to hill shading)
- Spatial Analyst - Surface Analysis, ArcToolBox - Spatial Analysis Tools(!)- Aspect

Hillshading

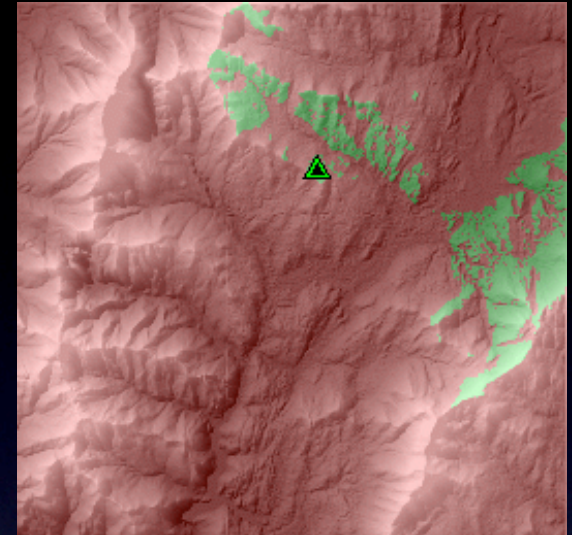


- Trick to fool our eyes to see 3D relief
- Simulate Sun from direction (0-360) and angle (0-90), creates grey scale map (0-255)
- Gotcha: Sun must be in the North (270 - 90), otherwise relief looks inverted (human evolution: sun from above)
- 10-50% transparent, drape over DEM
- graphical only(Symbolization) - less options, not as good?
- Spatial Analyst - Surface Analysis, ArctoolBox - Spatial Analysis Tools(!)



Viewshed

- needs a shapefile with points (Sturgis -summits)
- Which cells can be seen from these points?
- Shoots rays from point to each cell, check for intersect with terrain
- Can be more complex - add more data to points: height, view angle, distance (more next lab)
- Observer points tool: which points can see other points?
- Spatial Analyst - Surface Analysis, ArcToolBox - Spatial Analysis Tools(!)



HW I questions? Help?