## Geol 588

## GIS for Geoscientists II

### Lecture 9:TINs

TIN - triangulated irregular network



- Made via direct connection of 2D points (features)
- No prior interpolation needed
- points also carry elevation (z) values
- Delaunay triangulation:
  - optimal triangle shape, uses closest points
  - avoids very thin ("skinny") triangles



### Edge: Blue Node (vertex) : Red





Nodes and edges of a TIN

Nodes, edges, and faces



TIN in perspective view

# TIN vs raster for a elevation surface



Raster representation of a surface

+451	+454	+457	+459	+458
+453	+455	+456	+461	+461
+454	+459	+458	+465	+467
+456	+460	+462	+473	+469
+458	+462	+464	+469	+465

### TIN:

- start with x/y/ coordinates and z values (raw points)
- implies linear interpolation by directly connecting points to triangles
- •usually not a rectangle but a wrapper around points ("convex hull")
- •can internally incorporate line features (break lines)

#### Raster

- Always a rectangle (constant cell size)
- cells contain z value (but no explicit x/y coordinates)
- some (most) z values are interpolated from "raw" points

## TIN exercise

- data is in data/tin\_exercise
- Remember to activate 3D analyst extension and tool
- Create TIN from features (Delaunay triangulation)
- ArcMap GUI: 3D analyst Create/Modify TIN (tin\_raw)
- need point features (raw.shp) with a elevation attribute (elev)
- Tag: store the elevation values inside each point in the TIN
- Layer Prop. Symbology: graduated color (10 m intervals)
- Add : more face (triangle), edge and Node (point) visualizations

Create TIN From Features			? 💌
Inputs Check the layer(s) that will be u specify its settings. Layers:	sed to	create the TIN. Cli	ick a layer's name to
<b>∨</b> raw		-Settings for selec Feature type: Height source: Triangulate as: Tag value field:	ted layer 2D points elev mass points elev
Output TIN: \\delphi\geol588	3\data\	tin exercise\tin_fro	om_raw_pts

<ul> <li>Elevation</li> </ul>		vation with draduated co	or ramp
	Value Fie Elev	eld ation	Classification Equal Interval
	Color Ran	np:	Classes: 32 V Classi
	Symbol	1,037.5 - 1,050 1,025 - 1,037.5	1037.5 - 1050 1025 - 1037.5
Add Remove	Add	d Renderer dge type grouped with unique dges with the same symbol ace aspect with graduated col ace elevation with graduated col ace slope with graduated col ace tag value grouped with un aces with the same symbol lode elevation with graduated of ode tag value grouped with un odes with the same symbol	symbol or ramp color ram ramp ique sym color ram nique syn

- Bring tin\_raw into ArcScene (add 3D analyst tool)
- Vertical exaggeration: 5 10, no smooth rendering
- Add Face elevation with grad. color ramp, color in 10m
- look at pit lines how many lines, which elevation?
- Modify existing TIN: GIU: add Feature to TIN or ArcTools - Edit TIN
- Add pit lines (elev) with a) mass points, b) soft braek line (tin\_pit\_mp, tin\_pit\_sl)
- view in ArcScene, what's the difference?

The input data to build a TIN includes four points and one line with two nodes.



The TIN that results when the points and nodes are processed as mass points.



When the line is enforced as a breakline, the line is maintained in the TIN. Note the z-values of the introduced nodes



- hard vs. soft break line?
- How could we make this TIN a rectangle?

- get difference between tin\_raw and tin\_pit\_sl (volume of the pit)
- convert both to raster, subtract (pit\_vol)
- drape pit\_vol over tin\_raw in ArcScene
- ArcMap GUI buttons (3D analyst tutorial p.40 -)
  - create a contour
  - create line of sight
  - create profile graph press after you made a line via line of sight or via interpolate line to get graph of the profile

- How many nodes and triangles does tin\_raw have?
- simplify the TIN: 3D analyst tools TIN Surface - Decimate

   (a) z tolerance 0.1
   (b) 5000 triangles