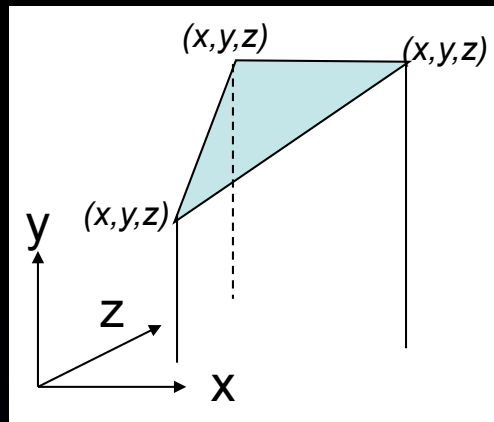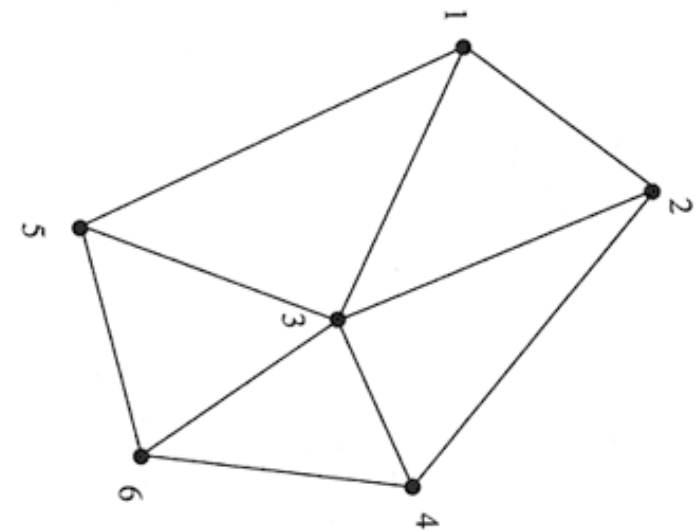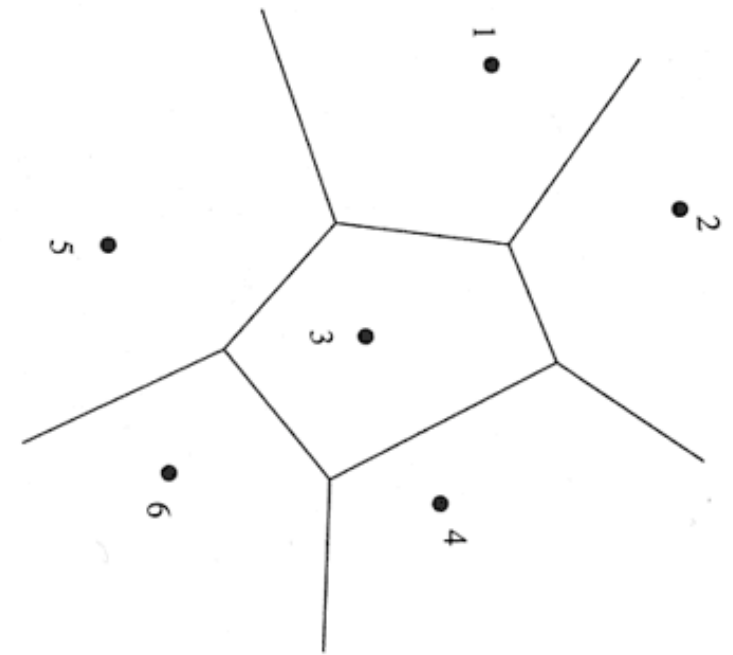# Geol 588

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GIS for Geoscientists II
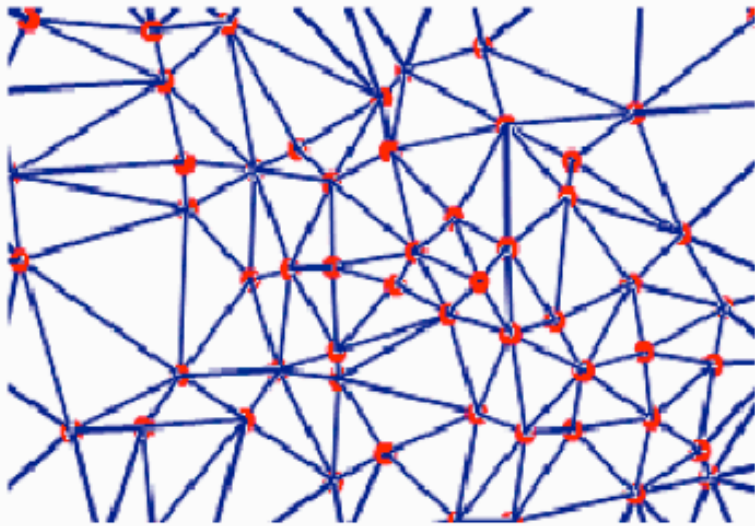
Lecture 9: TINs
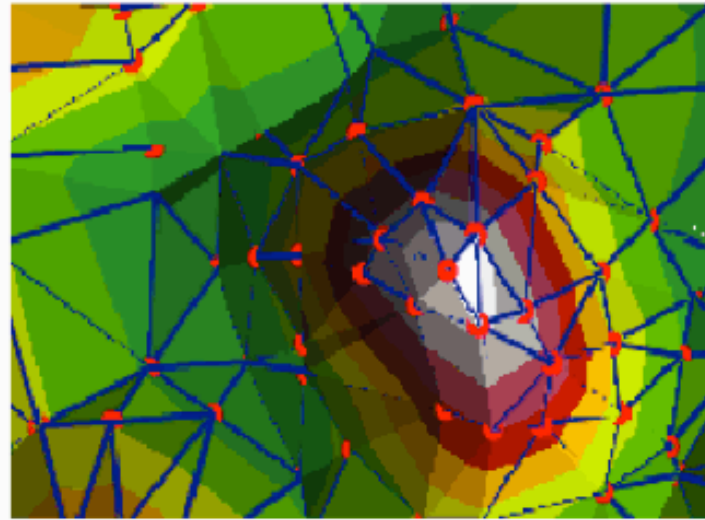
TIN - triangulated irregular network

- 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
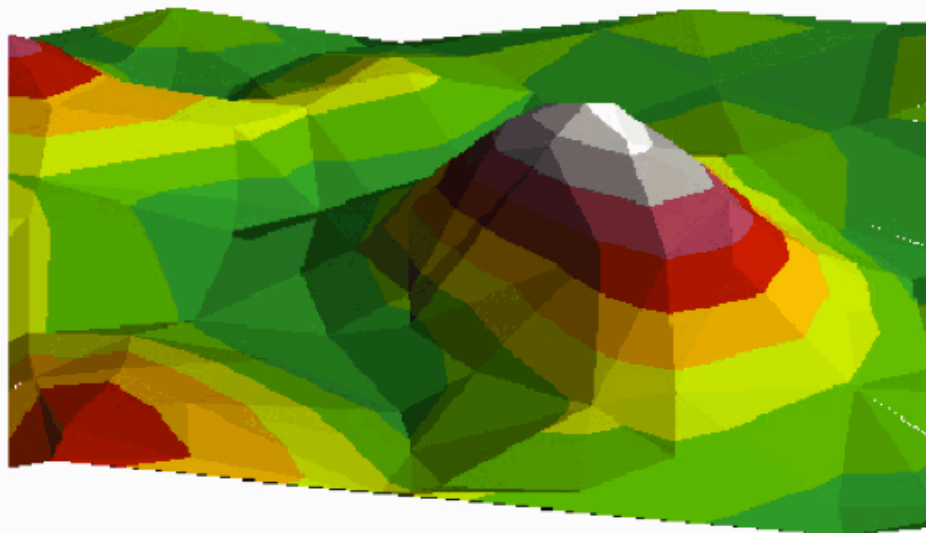 - avoids very thin ("skinny") triangles

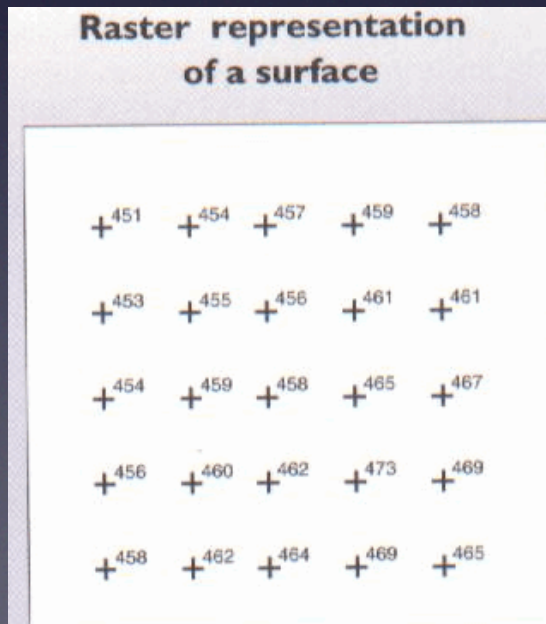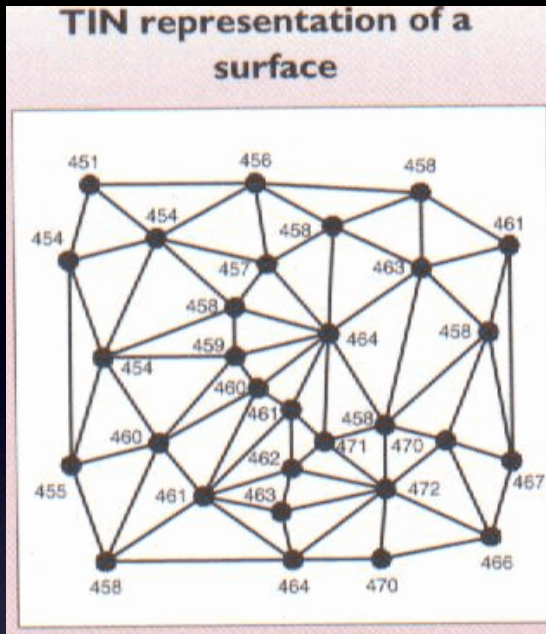Edge: Blue   Node (vertex) : Red

Nodes and edges of a TIN

Nodes, edges, and faces

TIN in perspective view

TIN vs raster for a elevation surface

TIN representation of a surface

Raster representation of a surface

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

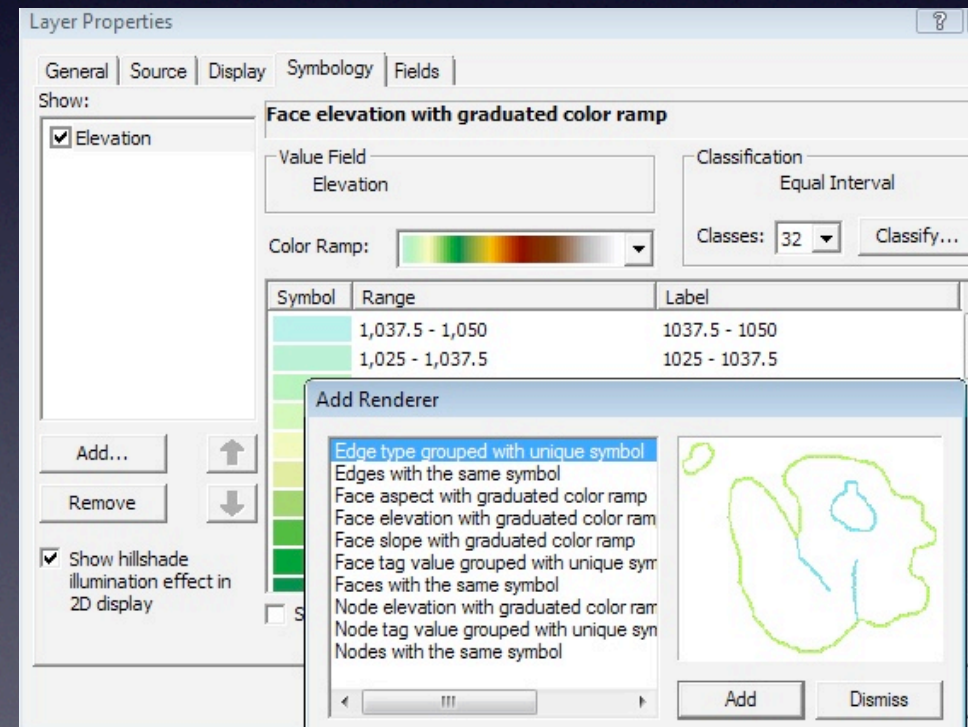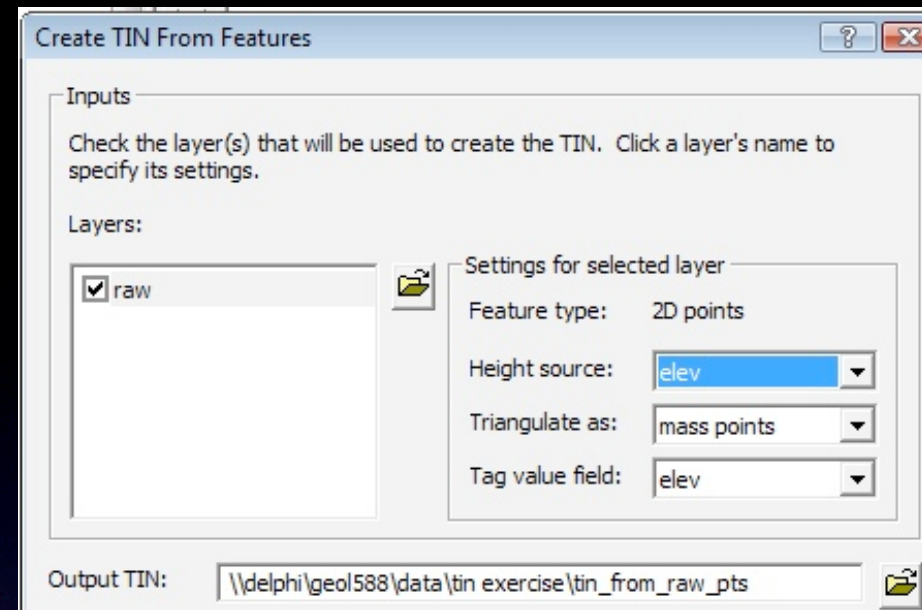Create TIN from features (Delaunay triangulation)

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

- 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)

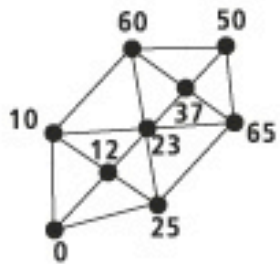- view in ArcScene, what's the difference?

The input data to build a TIN includes four points and one line with two nodes.
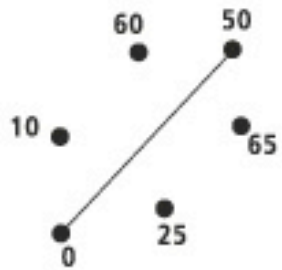
The TIN that results when the points and nodes are processed as mass points.
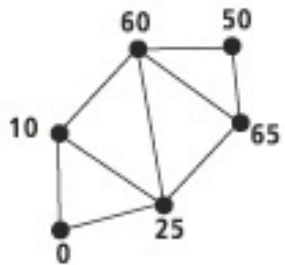
When the line is enforced as a breakline, the line is maintained in the TIN. Note the z-values of the introduced nodes

- 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