

# GEOMORPHIC CHANGE DETECTION

## C. REVIEW OF BUILDING DEMs

**USACE Workshop**  
 Kansas City  
 May 30- June 1, 2012



**US Army Corps of Engineers**



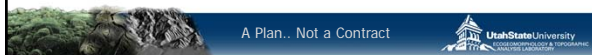
**NORTH ARROW RESEARCH**



# WORKSHOP PLAN – DAY 1... (MORNING)

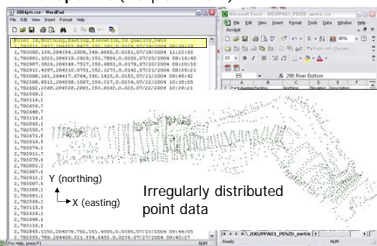
|   |  |
|---|--|
| A. Introductions  | 9:00 to 9:30                           |
| B. Review of Topographic Surveys & Data                 | 9:30 to 10:00                          |
| <b>C. Review of Building DEMs</b>                       | 10:00 to 10:45                         |
| D. Working with Cross Section Data                      | 10:45 to 11:00 Break<br>11:00 to 11:30 |
| E. Essential Best Practices to Support change Detection | 11:30 to 12:00<br>12:00 to 13:30 Lunch |

A Plan.. Not a Contract



# TOPOGRAPHIC DATA: VECTOR DATA

- A collection of points with attributes: Point Number, Easting (x), Northing (y), Elevation (z), Description, etc.
- Variety of acceptable formats: **ascii** (\*.txt or \*.asc or \*.dat), **delimited** (\*.csv), **Excel** (\*.xls) or **shapefiles** (\*.shp and \*.shx).

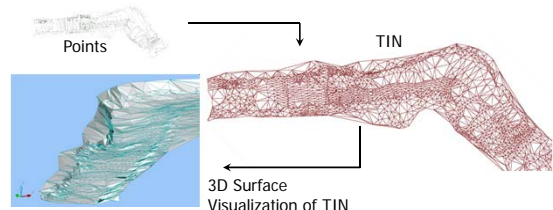


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# BUILDING A TIN FROM VECTOR DATA

**Triangular Irregular Network (TIN):** the simplest and most common interpolation technique for building surfaces with irregularly spaced elevation data (McCullagh, 1981)

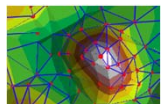
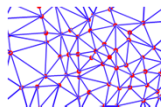


McCullagh MJ. 1981. Creation of smooth contours over irregularly distributed data using local surface patches. Geophysical Analysis. 13: 51-63.



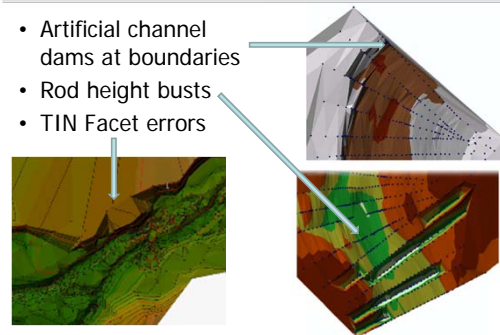
# DETAILS OF TINs

- Vertices connected with a series of edges to form network of triangles (continuous)
- ArcGIS uses Delaunay triangulation, which maximizes interior angles
- Resolution can vary



# WHAT CAN GO WRONG WITH SOME TINs?

- Artificial channel dams at boundaries
- Rod height busts
- TIN Facet errors



## BREAKLINES

- Prevents interpolation from going across
- Breaklines become TIN edges
- Allows for higher quality surfaces with lower point density

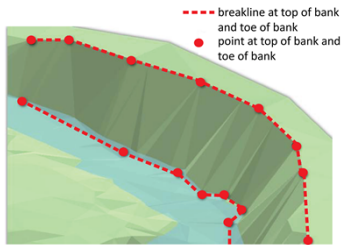


Figure 1. Example of top of bank and toe of bank XYZ points and breaklines. Breaklines are often used to capture continuous linear features and breaks in slope (e.g. toe of bank) as, under certain stream conditions, breaklines can afford greater coverage more rapidly than XYZ point acquisition alone.

From Portugal et al. (In Prep); Adapted from Bouwes et al. (2011) CHaMP Protocol



## HYDRO-ENFORCED BREAKLINES

From Portugal et al. (In Prep)

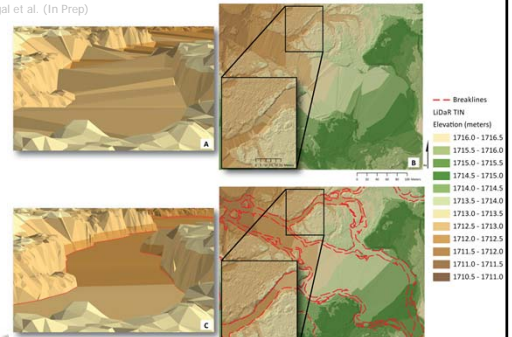
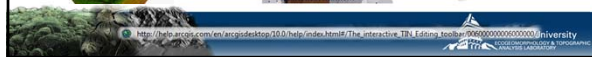
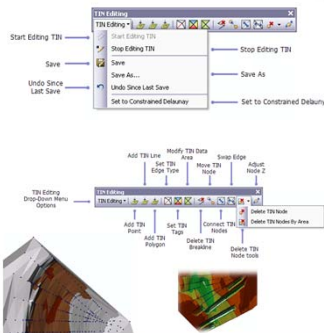


Figure 2. (A) TIN of Lenth River sample reach without hydraulically enforced breaklines. (B) TIN with the addition of hydraulically enforced breaklines in cross-section (C) and at reach-scale planform view (D). Addition of breaklines greatly reduces effective point density and storage.



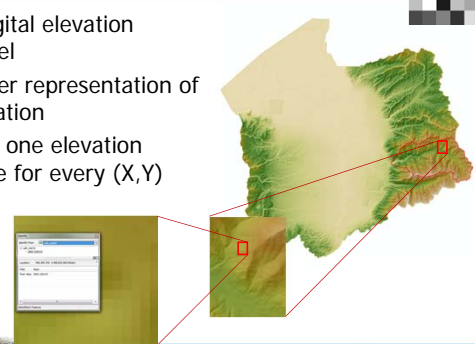
## INTERACTIVE TIN EDITING TOOLBAR

- Remove busts
- Add points
- Add break lines
- Change order

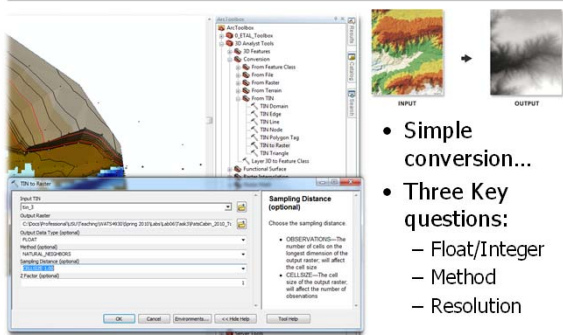


## RASTER DEMs

- A digital elevation model
- Raster representation of elevation
- Only one elevation value for every (X,Y)



## DEM FROM TINs



- Simple conversion...
- Three Key questions:
  - Float/Integer
  - Method
  - Resolution



## TODAY

