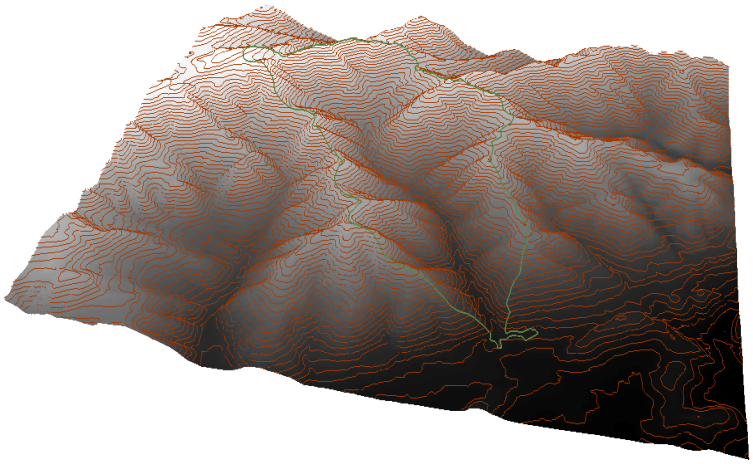
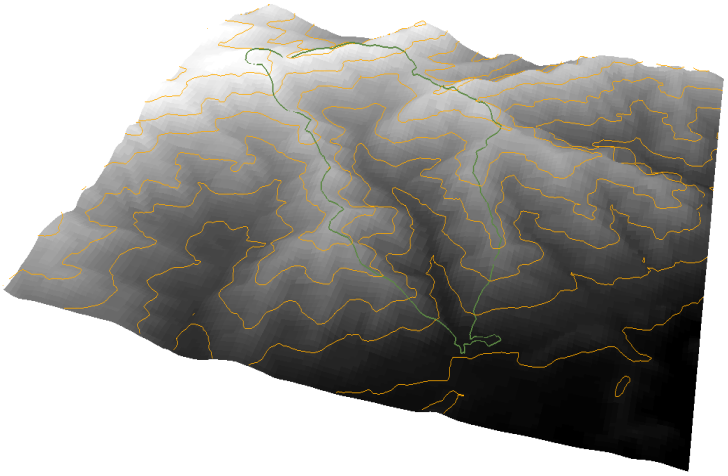
Alice Hua
GEOG 188: Lab 102
11/7/19

Lab 9: Creating TIN and 3D Scenes (ArcScene)



NED1_9arc - Contour 10 meters

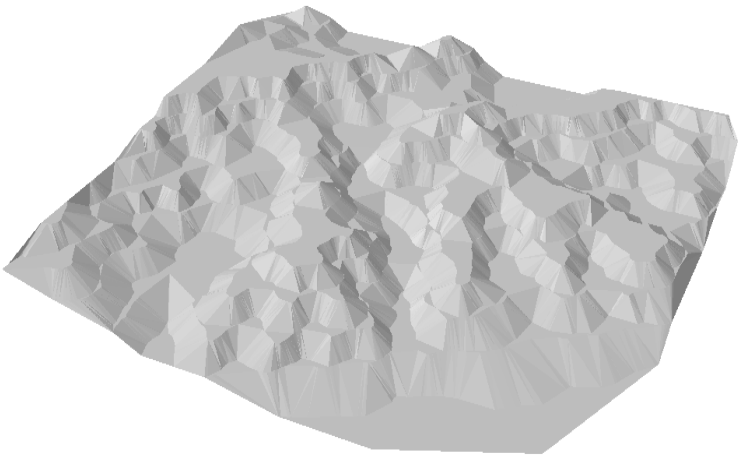


NED1arc - Contour 55 meters

Question 1: I generated 2 new sets of contours: a 55m from NED1arc and 10m from NED1_9arc. Even though the rasters are projected in the NAD_1983_StatePlane_California_III_FIPS_0403_Feet, the NED z values are in meters, therefore, I input 55m and 10m for the contour interval in the Contour tool (Spatial Analyst Tools: Surface -> Contour). I kept the z-factor at 1 because I wanted the contour calculation to be carried out in meters first, then I converted the contours into ft by [Contours] * 3.2810 and I added the results to a new field named cont_ft. The other way I could have done this task is inputting 3.2810 for the z-factor so that it converts the raw data from meters to feet. Then, instead of using 55m for the contour interval, I would put 180.446ft (55m * 3.2810 to convert it to feet). This will allow the entire result to be all in feet with the 55m and 10m.

Question 2a: Create TIN from the contours made above.

TIN - 10 meters contour

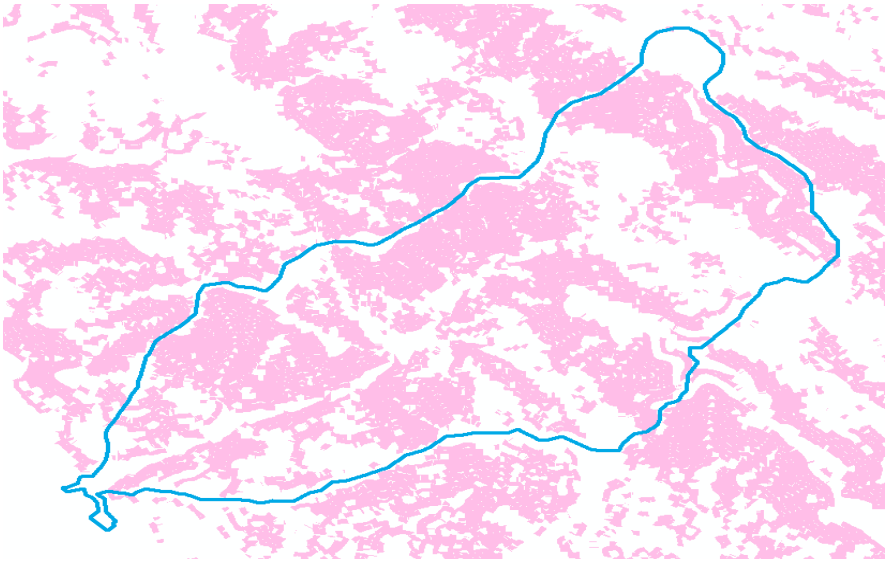


TIN - 55 meters contour

Question 2b: Drape ortho image & describe draping technique.

To drape this ortho-image of the Claremont Caynon, I set the base height floating on my TIN_10m_1/9arc surface with custom unit of 1 factor. To eliminate the blackground for no-data cells, under, I checked the Display Background Value: (R, G, B) as 0, 0, 0 under Symbology (Layer Properties). I then turn off the TIN surface to get this resulting image.

Question 2c: Produce 2 Factor Maps of Opportunity and Constraint for Housing Suitability Analysis.



Constraint map:
Using the TIN_10m_1/9arc layer, I generated TIN triangles using Degree for Slope Unit. I exported the layer into the geodatabase, then reclassified the data manually to have 6 equal interval, 1 with class 1 being 0 degree for flat slope, and no ouline around all triangles. Once I got the layer visualized, I queried for slope degree that is higher than 25 as the Constraint factor, we would not prefer any manmade structure on a slope higher than 25 degrees. I then exported the selected attributes to a shapefile so to avoid lengthy processing time with the TIN triangle layer. Using the Dissolve tool, I blended the triangles together.

Opportunity map:
The steps are repeated as above, however, with a query of slopes less than 15 degrees as the opportunity factor.

Question 3: Drape 1 line/arc layer and 1 polygon layer on TIN. Then extrude houses by 35ft.

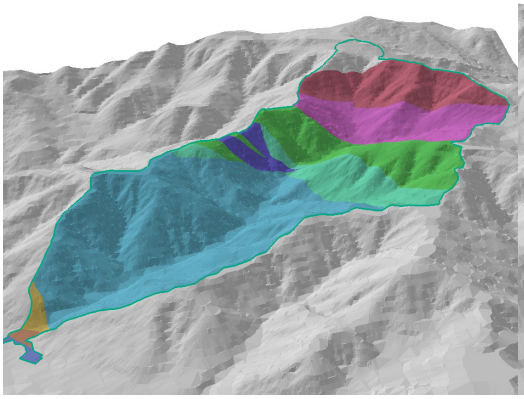


Fig 1: Geology layer on TIN.

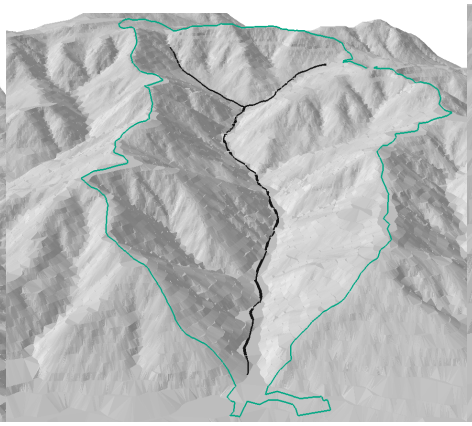


Fig 2: Hydrology layer on TIN.

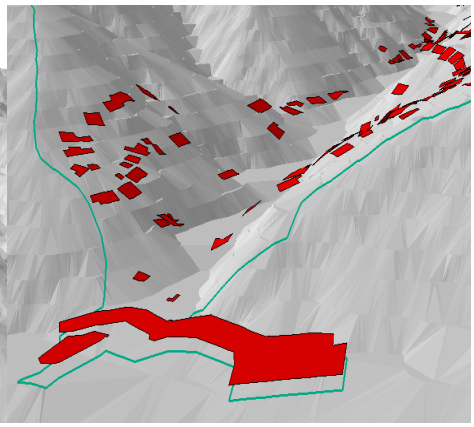


Fig 3: Houses excluded by 35ft

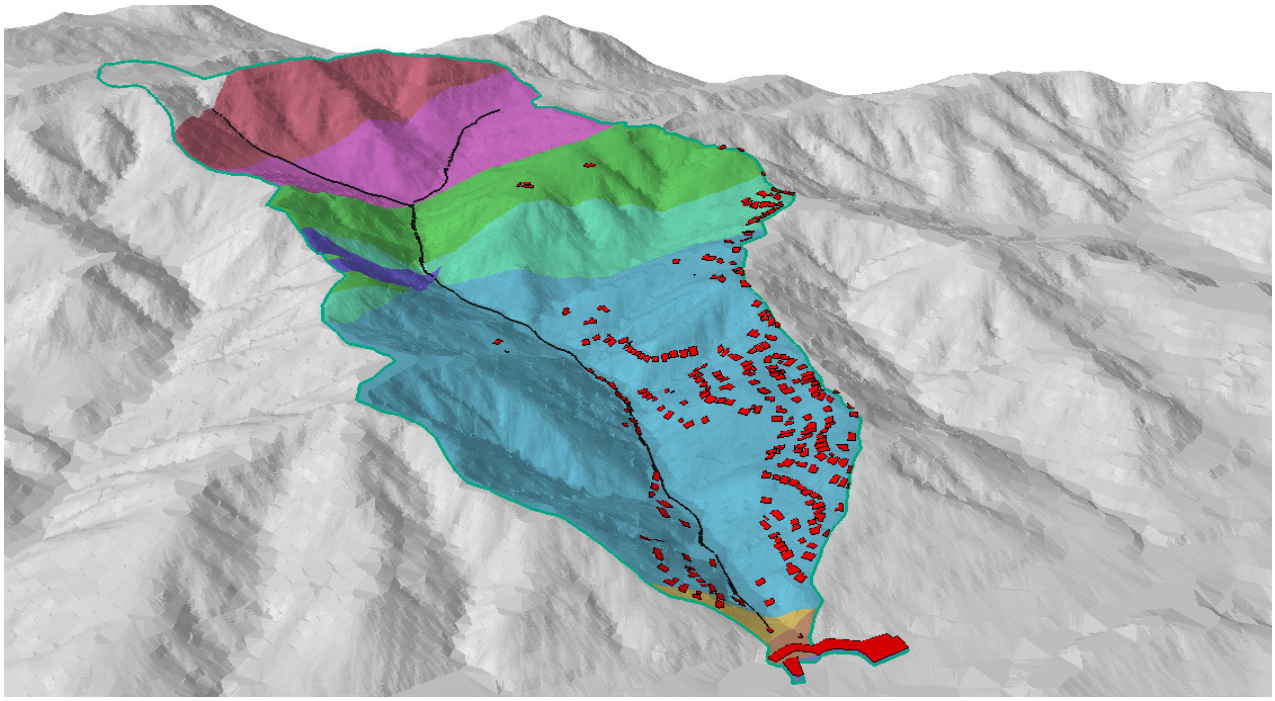


Fig 4: Draped all layers over TIN_10m_1/9arc

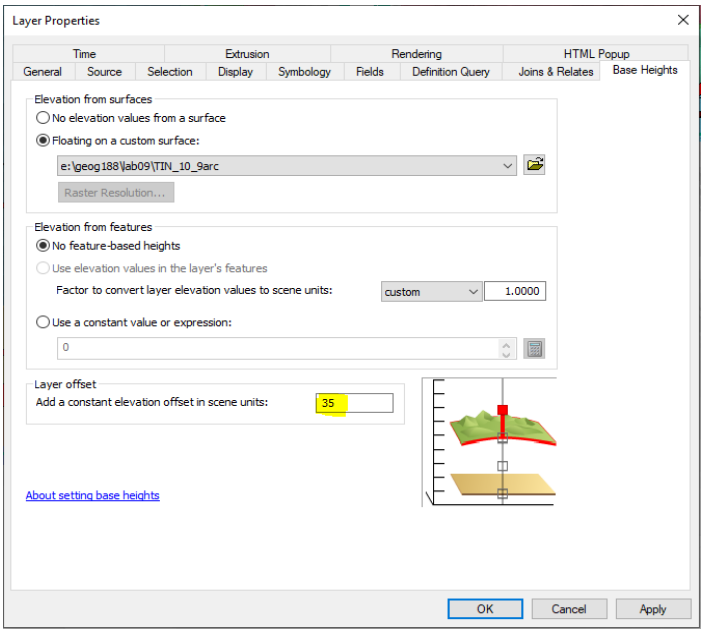


Fig 5: Base height setting for houses

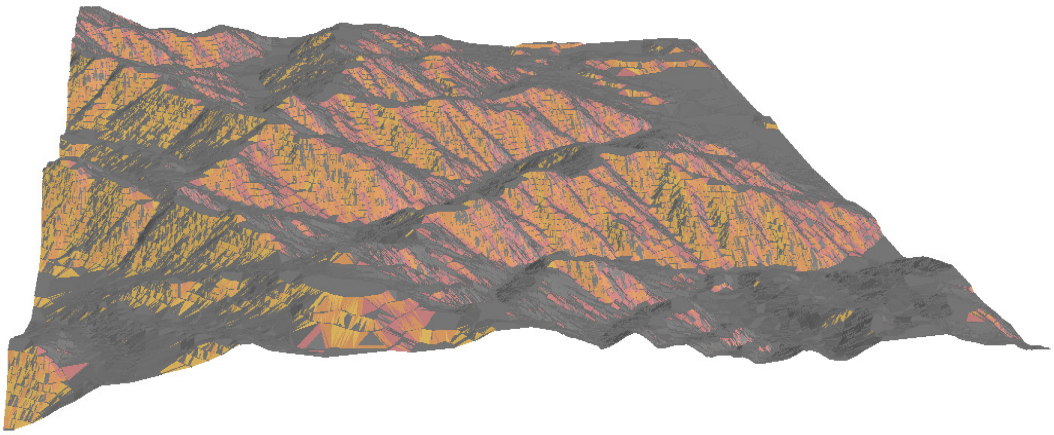
To drape the hydrology line layer and the geology polygon layers over the TIN_10m_1.9ar, I initially used the Interpolated Shape tool to turn the 2D layers (geology, hydrology) into 3D, but the polygons came out flat on the TIN even though their boundaries anchored to the TIN surface.

I solved this problem by using the Interpolate to Multipatch tool. I set the base height for these 2 layers to float on my TIN surface with no extrusion.

The houses are set to floating on top of the TIN layer with a extrusion of 35ft seen in fig. 3 profile view, with the base height setting in fig. 5.

This extrusion option is definitely useful for certain purposes where the layer is better viewed with relative higher elevation than the surface layer.

Question 4: Generate new Aspect map from TIN, covert to larger aggregated polygon. Drape NW, N and NE polygons on TIN.



To create an Aspect map, I used the added the Renderer "Face aspect with graduated color ramp". I then separated the North and South facing aspects to cool and warm colors to visualize. Next, I used the Surface Aspect tool to calculate the aspect codes from the TIN layer. This AspectCode is then joined with the corresponding directions. Here is the part where my program crashed several times. I switched to ArcMap to use the Dissolve tool so to aggregate the directions. I moved it back to ArcScene to do the selective draping for only N, NE and NW directions. However, the dissolved aspect layer had only the rows for each direction, when this is draped onto a 3D surface, these aggregated polygons stretched in the horizontal dirrection which did not represent the terrain at all. I had to use the undissolved aspect layer, set no color to all other aspects except for the ones specificied in the question, set the ouline to no color to give a more representative terrain with aspects.

Question 5: Generate heights of each house and extrude houses based on their actual height.

To get the height for the houses, I used the Raster Calculator and subtracted DSM from DEM. This height raster is then clipped to the boundary of house polygons. Next, I converted the raster height cells to vector height points by using Raster to Point tool. With these new height points filling the same spatial extent of each house polygon, I performed a spatial join to the house layer and find the average height of each house. This average height attribute is then used as a extrusion value when I draped it over the TIN surface in ArcScene.