HACETTEPE UNIVERSITY

GEOMATICS ENGINEERING

GMT 431 PHOTOGRAMMETRIC IMAGE ANALYSIS

MIDTERM - 1

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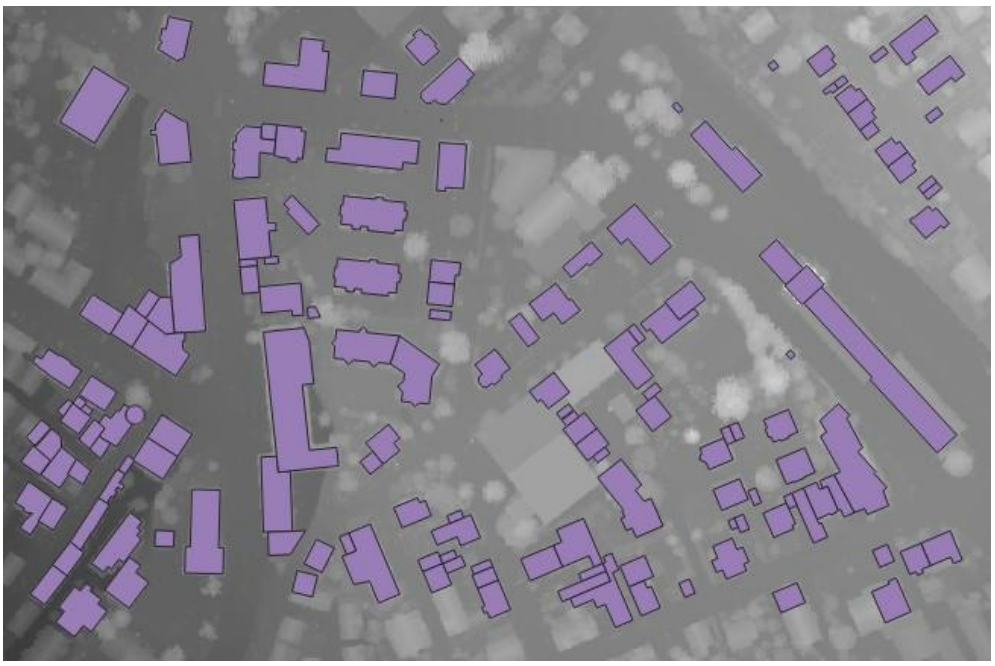
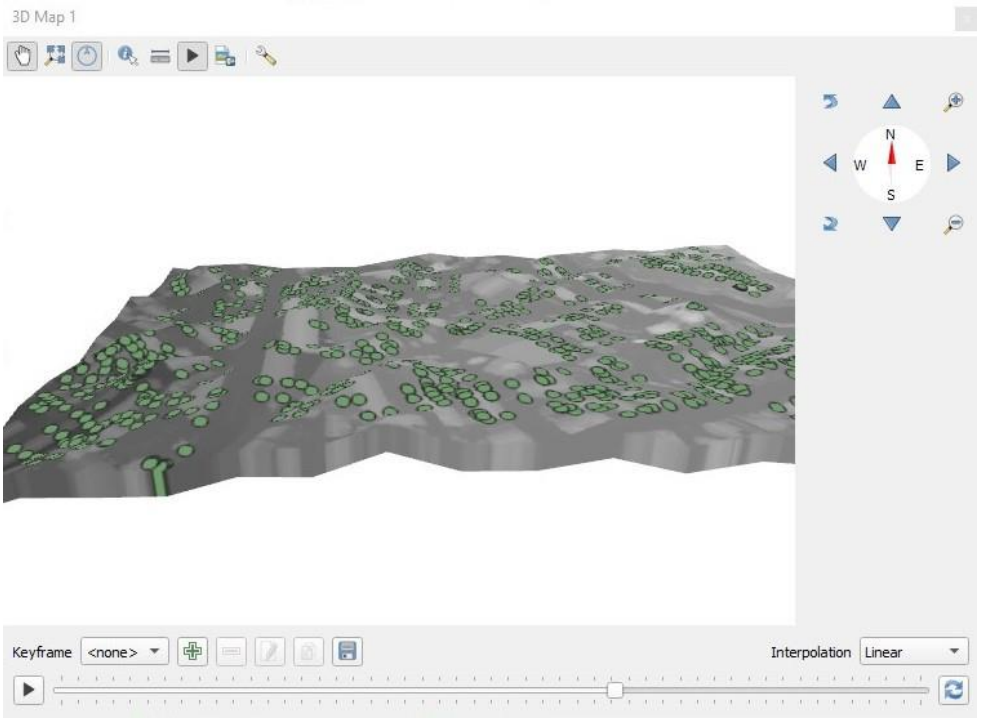
1 – Layer Visualization:

Building polygon layer on to the DEM (ALS):



Building's corner points as 3D visualization:



2 – Extracting Z coordinates:

I used QGIS for this step.

First I download data. I converted data's coordinate system epsg:4326 to epsg:32632. From properties it does not work so I converted it during exporting the data. Then I re-import it.

I remove the datas outside of the given ALS areas with toggle editing mode.

I tried a lot of method for extracting elevation data like point sampling tools plugin – add raster values to point function and Drape (set z values from raster) function. In the end point sampling tools and raster values to point function extracting the z values to point layer and lose the data of which points belong to which building so I prefer to use Drape function as result. Details about it explained in part5.

3 – World Coordinates to Pixel Coordinate system:

I used Matlab for part 3 and 4.

For better understanding this task I upload 106.jp2 image to qgis. I realized the origin of the 106.jp2 is upper-left pixel so it must be pixel coordinate system. Then I check to lower-right pixel and its -13824th row and 7680th column. Then I notice the file coordinate system (writen in pdf) which is means interior orientation's focal lenght and principal point. I used those values with exterior orientations to in my code. Then I coded my transformation code from what the lesson 4 tells me.

```
%rotation matrix
rotmat=[r11 r12 r13 0; r21 r22 r23 0; r31 r32 r33 0; 0 0 0 1];

%focal lenght matrix with coordinate origin translation
focmat=[f 0 colpixel 0; 0 f rowpixel 0; 0 0 1 0];

%shift matrix
transmat=[1 0 0 -X0 ; 0 1 0 -Y0; 0 0 1 -Z0; 0 0 0 1];
```

I used this principal point coordinates in focmat matrix. It offset the origin; center to upper-left.

Whole transformation matrix values (world to pixel coordinate system transformation) below here (those values are multiplication of the three matrices which are focal lenght matrix * rotation matrix * shifting matrix):

```
>> focmat*rotmat*transmat

ans =

          10011.408618429         -11.0527958638582         -3810.14111425674         -4914487713.70721
          41.592792304806         -10057.6579946047         -6827.70310596411          54494474736.4182
       0.00298833023095672      -0.00839596480151549       -0.999960288040221          45174.4451984524

>>
```

4 – Ploting the boundary of the buildings:

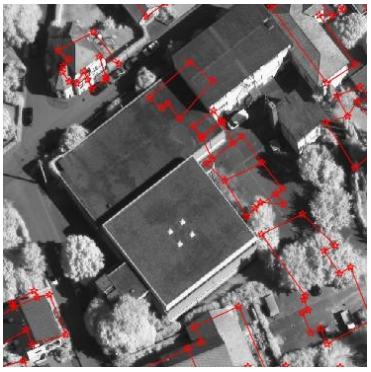
5 – The difficulties I faced while making this homework:

Technic Difficulties:

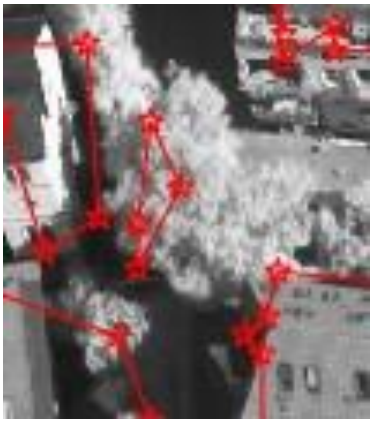
The first difficulty shocked me. When I did everything, the code draws lines between all points because I used point layer data and it not have the data about which point belong to which building. I extract the corner point of the building with vector-geometry-extract vertices method and then I used point sampling tools but its totally wrong. Then I used Drape function on building polygon and used this building polygon shapefile.

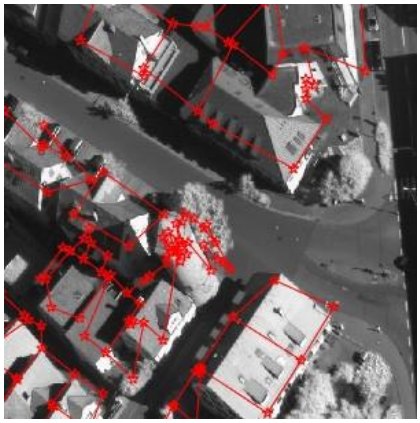
Exterior factors:

The DEM data not well updated so some buildings constracted and some of ruined.



Lidar algorithms can detect difference between trees and buildings but trees still can be a little bit problem and some trees counted as building in OSM's data. Espacially when trees very close to buildings and have the same elevation.





In conclusion; those problems can caused by a lot of factors like Lidar cloud density, images gsd size (quality of the image), when the Dem or OSM data acquired, OSM's datacollection methods etc…