Photogrammetry with Unmanned Aerial Vehicle

Assignment

The software used for processing of images was Agisoft Metashape Professional Version 1.8.2

Tasks

1. The images used in this exercise can be gathered Downloaded the gathered data from the folder “Assignment” using the following link. https://myfiles.sbg.ac.at/index.php/s/bFtBDP25yp54mRp

Downloaded the Image using the link above.

2. Aligned the images and assigned real world coordinates to the data. Made sure to set the right CRS during GCP import (Note: after the GCPs have been assigned to the respective marks, the sparse point cloud must be updated by clicking on "optimize camera"!) The Images were gathered in University of Salzburg campus in NAWI

3. Compute either a dense point cloud or a mesh. Document your decision accordingly.

4. Derive an orthoimage and a DSM and export them in a suitable format.

5. Create a minimalistic map displaying the two computed results, the location of the GCPs and add it to your report. Please make sure to differentiate between a screenshot from a software and a proper map.

6. To measure the goal size, you can either use the built in measure function in Agisoft or export the results and use a GIS software of your choice.

7. Provide a short (4-5 pages max) report which should include the following points:

a. Outline the individual work steps

b. State what and why you decided on in task 3 (point cloud vs. mesh)

c. Estimate the quality of your results and argue if they fit their ultimate purpose

d. Critically review the provided data and list some pros and cons about their quality.

The following list of screenshots along with brief explanation shows the steps performed to create ortho mosaic imagery from the given UAV data in order to measure the two goal posts within the football field.

After loading the images in agisoft, first used the function align images. In Agisoft, Align images means that the software overlaps the picture, look for the common objects.

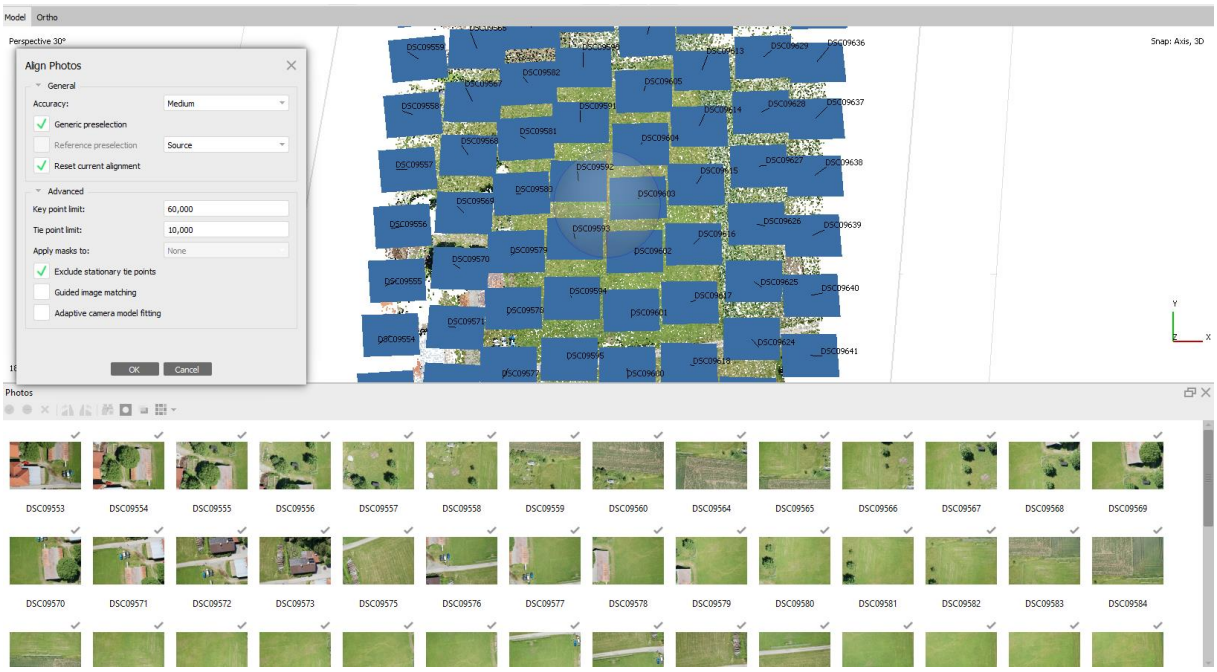


Figure 1. Aligned Images

In order to mark the reference points, Look to the Aligned Model and the image for location of GCP's. Use that to come up with the images with corresponding reference points. Place them by right clicking on them, place markers and then number of the marker.

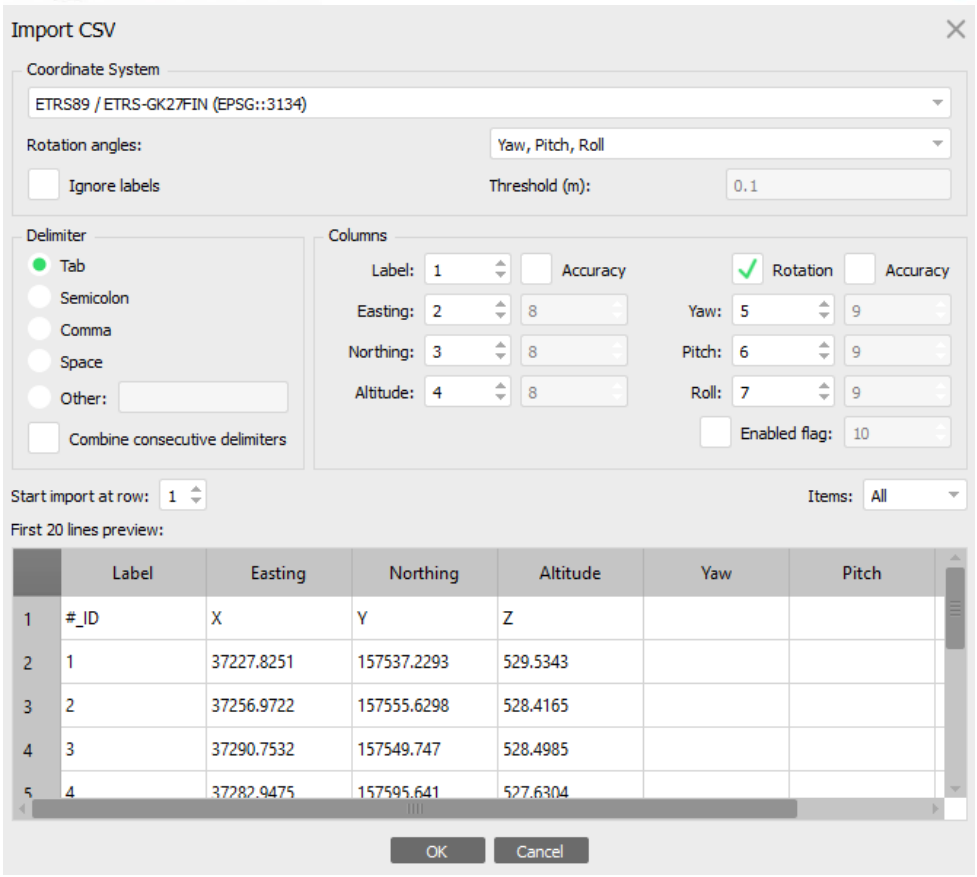


Figure 2. Coordinate System

Set the Coordinate reference system to European Terrestrial Reference System (ETRS89:3134)

Figure 3. Agisoft environment

Putting up markers one by one on all the images

Figure 4. Images with markers

Placed the 9 markers on the images but on a few images no markers were found.

The marker number 4 had the maximum error of 1.269 while marker number 9 had the minimum error of 0.032.

Then building the mesh in medium quality took around 25 minutes. Building it in a higher quality would have taken even more time. Whereas for building mesh in high quality takes 65 minutes as done by one of the fellows. For the task very high precision is not necessary. Therefore, medium accuracy would work fine.

Selected mesh directly without building the dense point could since dense point cloud was taking very long time to build up. The dense point cloud usually is recommended for higher accuracy.

Building up mesh took 18 minutes.

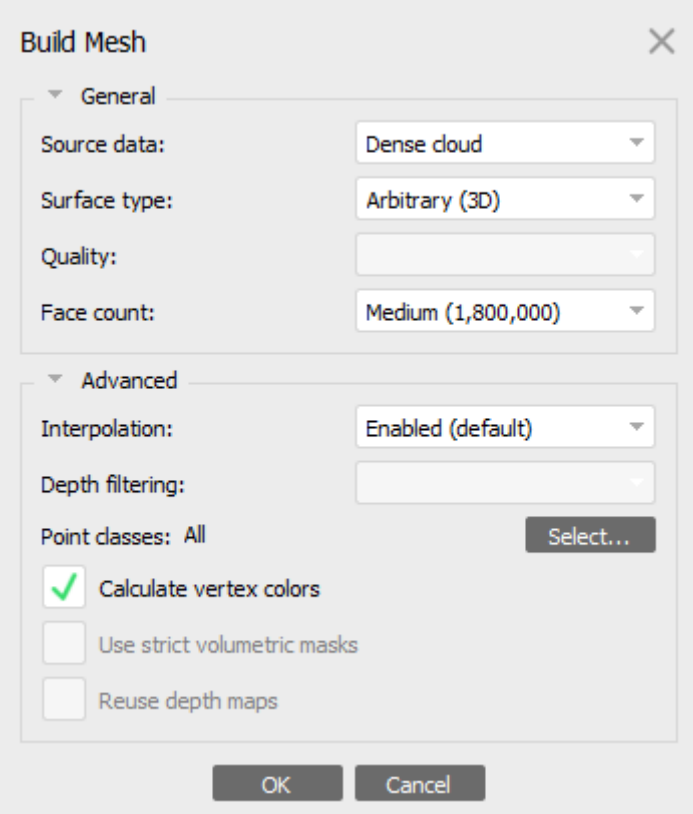


Figure 5. Building Mesh Function

Created the mesh with the above-mentioned parameters. The point cloud can be used in AutoCAD, and ArcGIS.

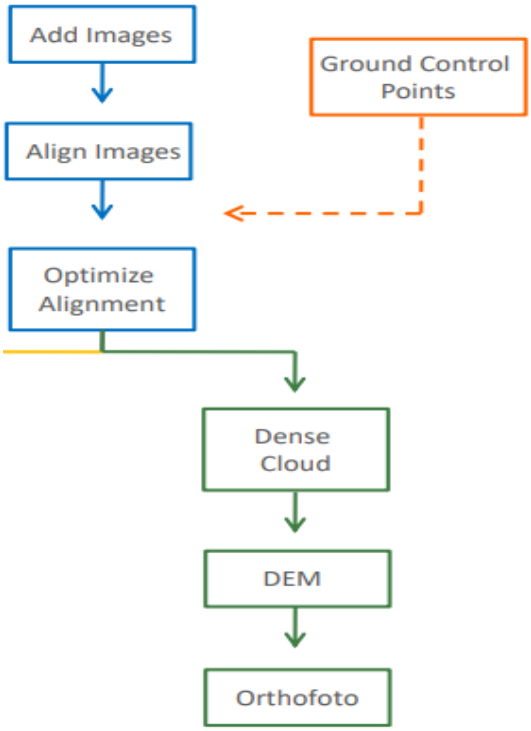


Figure 6. WorkFlow

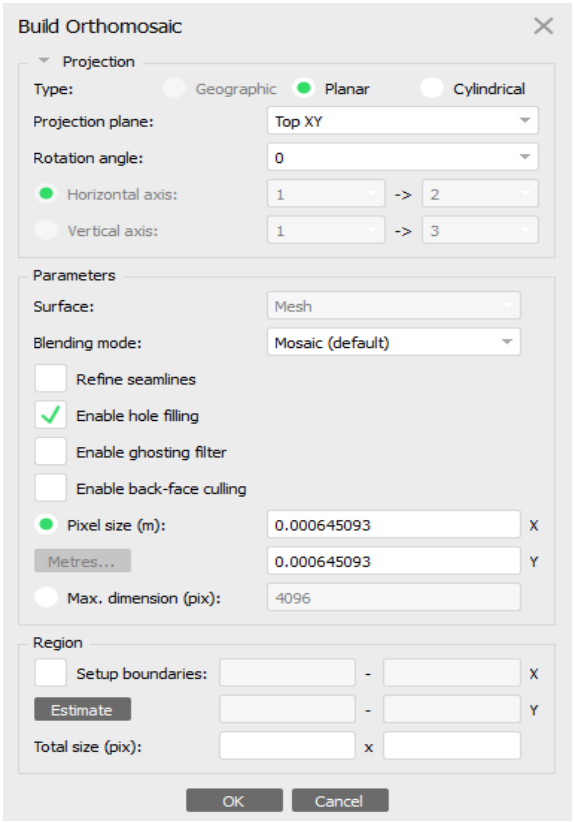


Figure 6. Orthomosaic function

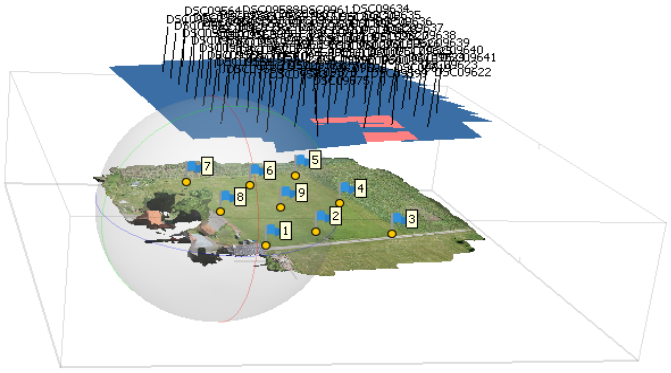


Figure 7. Model visualization with Ortho photo

For rechecking the results and as a practice, again built the DEM and Ortho mosaic with Optimized Camera Parameters and Geographic Type Projection to view the difference.

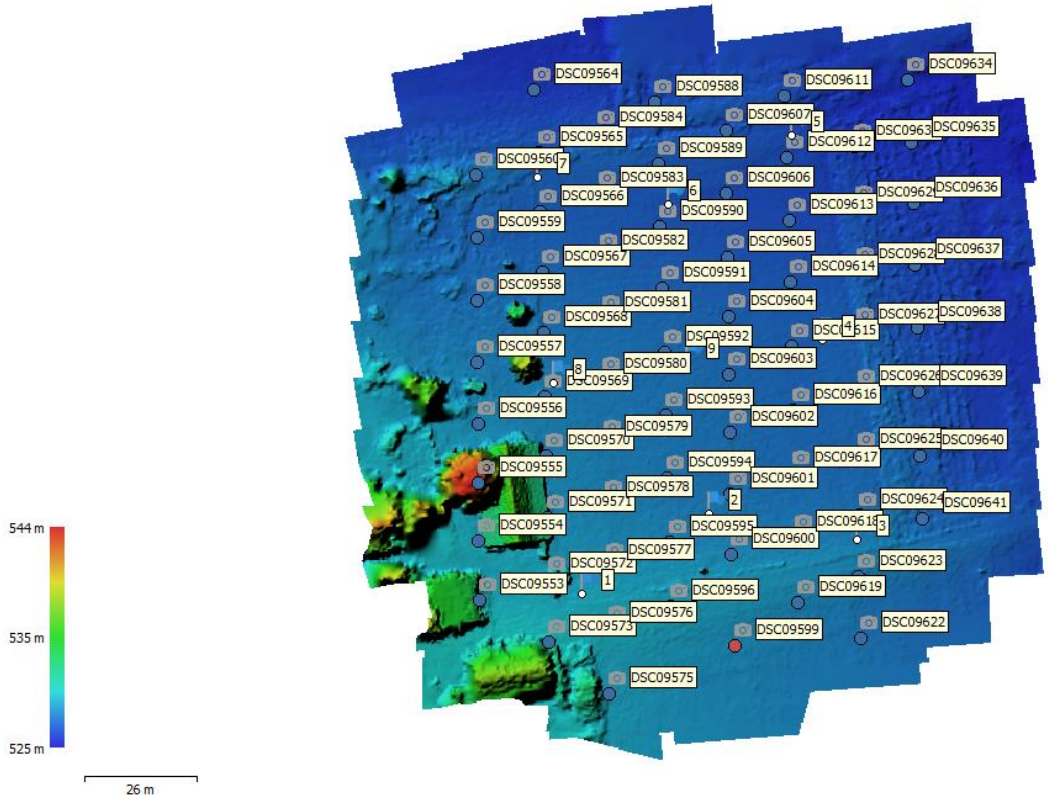


Figure 8. Orthomosaic Imagery I

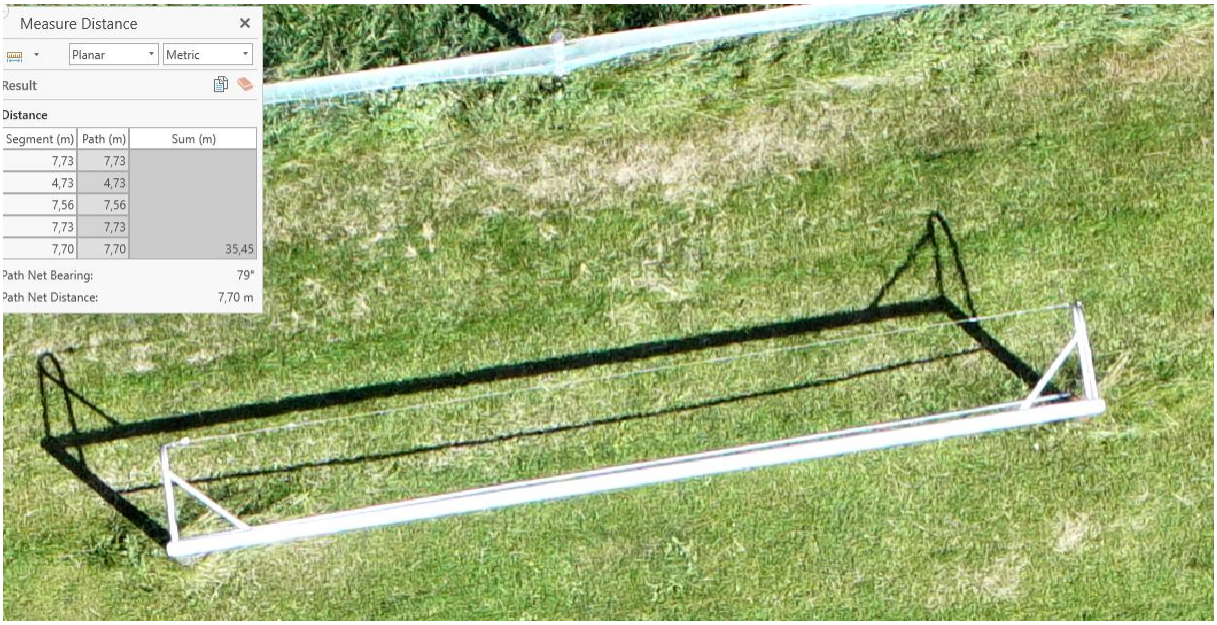
Measurement was made two software's

- Agisoft
- ArcGIS Pro

the software's gave exactly the same values for the both the goal posts.

For ArcGIS Pro, exported the orthophoto and imported the orthophoto into ArcGIS Pro and then used the measure tool to quantify length of goal post.

There was very little difference between the goal posts. The two opposite goal posts had a similar size. The difference of 7.73-7.70 = 0.03 meters is not a big one and it might be due medium quality of mesh and orthophoto created.



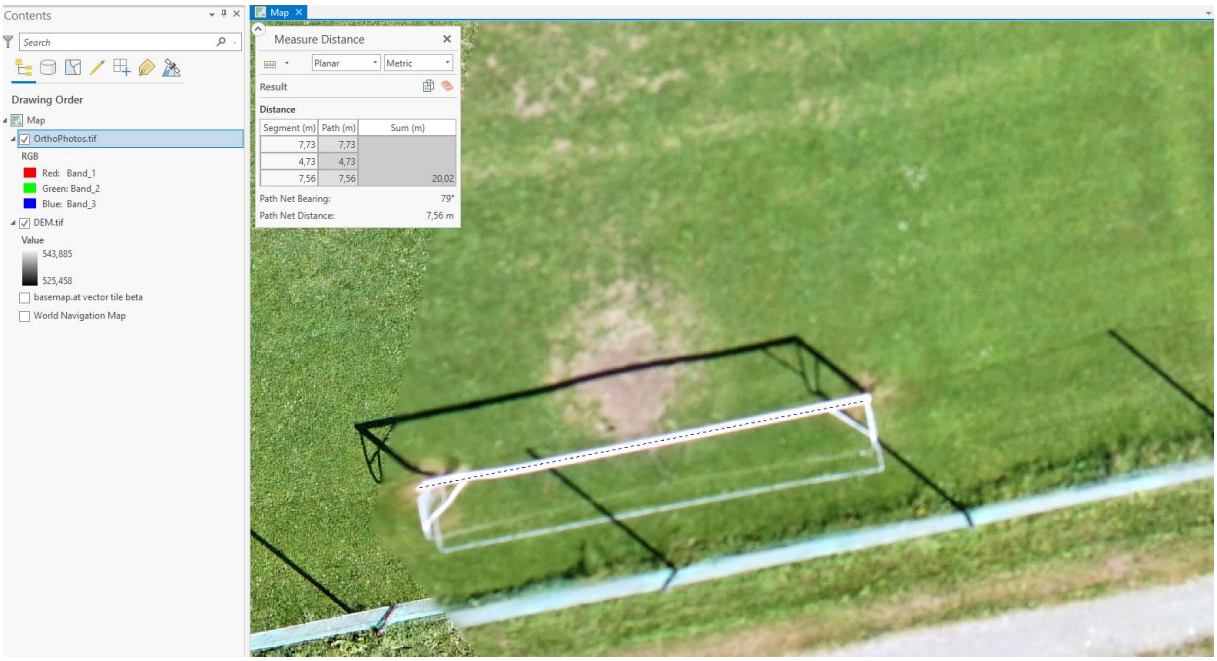


Figure 9. The two Goal Posts as shown in Orthomosaic Imagery

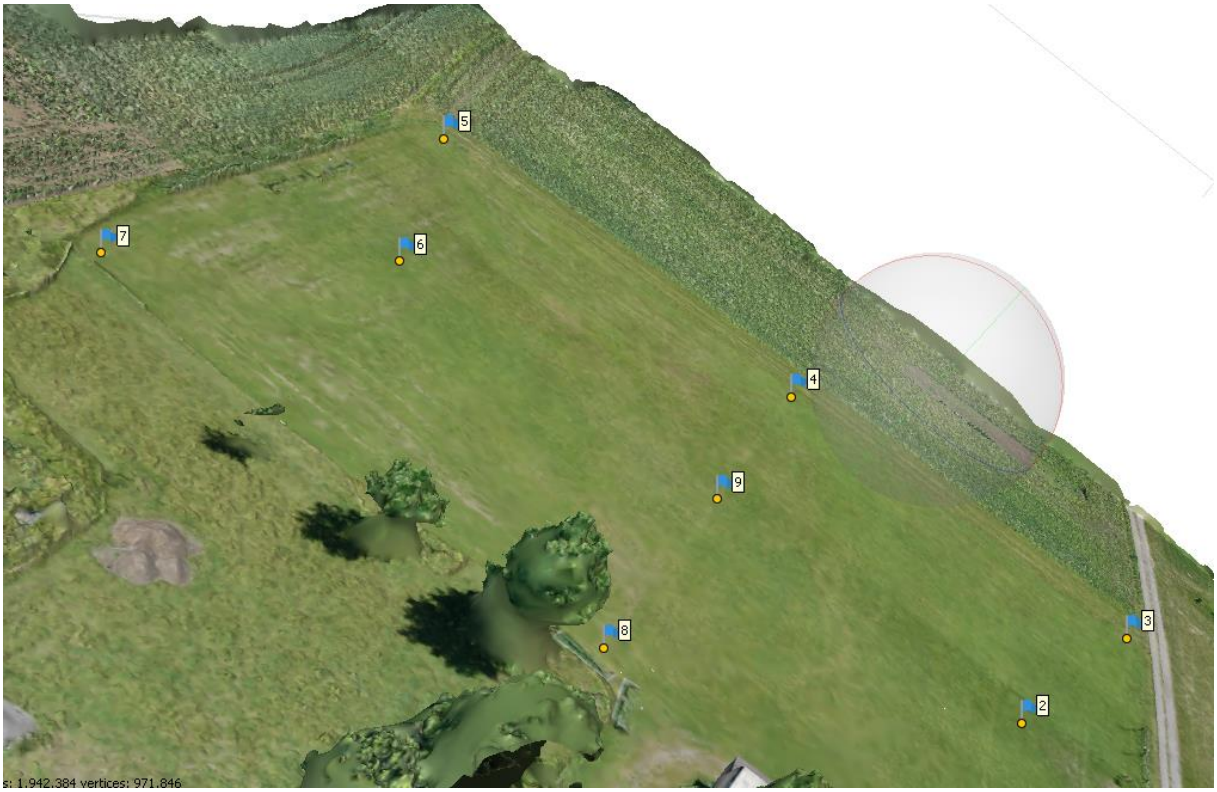


Figure 10. 3D Model

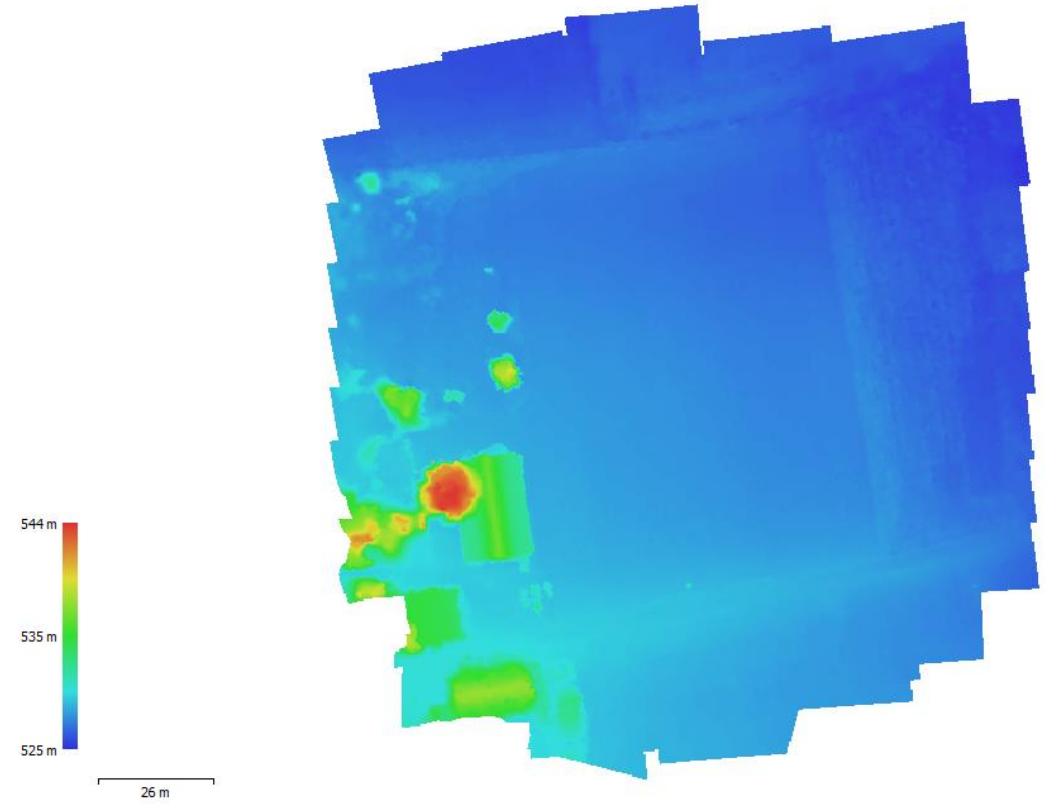


Figure 11. Hillshade visualization of Digital Elevation Model

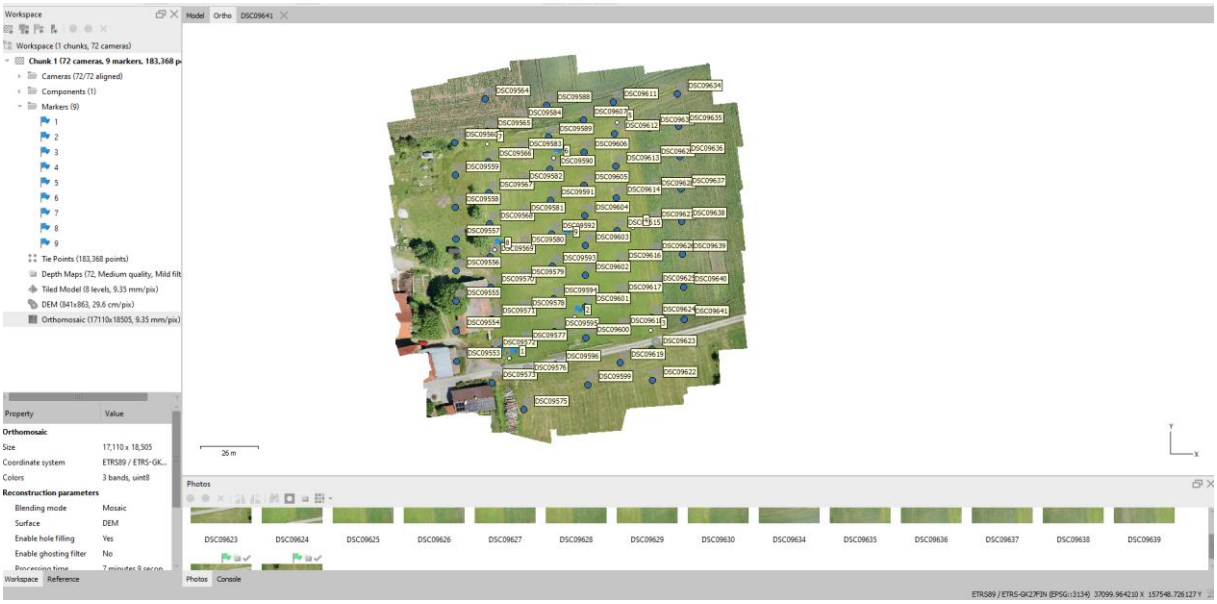


Figure 12. Orthomosaic Imagery II

Conclusion

The provided data was of High quality for the purpose of identifying difference in goal Post in the football field. Data acquired through the drone in NAWI on 26th May 2022, yielded imagery with high contrast due to bright sunshine. Similarly, provided data shows high contrast due to the same reason. Also, imagery was acquired in Natural Colour composite (Red, Green, Blue) bands. Therefore, interpretation of image was easier.

The quality of results is not high since I had used medium level processing. Still, it took several hours for me to process the data and complete the exercise. The provided data is appropriate for the task, but the quality can be improved by providing a greater number of Ground Control points.

Since, the software was taking lots of time to process dense point cloud. Therefore, I decided to directly go for mesh after (non-dense) point cloud. The goal was to analyse the length of Football goal post in which error or accuracy of few centimetres does not make a huge difference. The purpose was still served, therefore, I did not find any need to go for dense point cloud. If it was cadastral mapping or any other sensitive work where high accuracy is required, then I would better try out with dense point cloud. Though the quality of results is not very highly accurate in this case yet, for me it was found to be significant.

In this case, it was found that there is negligible difference among the size of the Goal posts. There is no bias and choosing any side would work same in the football match for the teams.