Application of 3D terrestrial laser scanning for measurements of buildings, situated in area, covered with bushes – technical difficulties, solutions and implementation

Chief Assist. Prof. Dr.-Eng. Gintcho Kostov
University of Forestry, Bulgaria
1. The aims of the paper

This study has the following tasks:

- to perform contactless measurements of buildings, which were **hard to access**;
- to **assess and analyse** the obtained quality of the conducted geodetic measurements;
- to find **solutions** for the technical issues, caused by the bushes;

This study was focused on **high-quality outdoor** terrestrial laser scanning.
Application of 3D terrestrial laser scanning for measurements of buildings, situated in area, covered with bushes – technical difficulties, solutions and implementation

2. 3D terrestrial laser scanning of the buildings. Technical difficulties

In the process of laser scanning, the presence of (tall) bushes all around the buildings had to be taken into account, fig. N 1.

The bushes, having various heights and density, were one significant technical difficulty to be solved.
3. Creation of the point cloud. Solutions of the technical issues

The point cloud was done in a **different**, **time** and efforts **consuming way**.

**No matching** spheres existed in the adjacent scans
- due to the **obstructions**, caused by the bushes.

In this specific case the application of the spheres for the registration process was **not possible**.
Application of 3D terrestrial laser scanning for measurements of buildings, situated in area, covered with bushes – technical difficulties, solutions and implementation

4. Creation of the point cloud. Solutions of the technical issues

The creation of the full point cloud was done via:

a) “registration using planes” software option;
b) the measurements from the redundant scan;
c) the common situation, created from the measurements and later on involved.

The technical issues were solved via:

- the existence of redundant information;
  - the software possibilities;
  - certain operator’s decisions.
Application of 3D terrestrial laser scanning for measurements of buildings, situated in area, covered with bushes – technical difficulties, solutions and implementation

5. Results from 3D terrestrial laser scanning. Analysis

Creation of the full model. Results

The full model was created via the registration of already created scans, fig. 2.

Fig. 2 Registration using planes, of all stations

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6. Results from 3D terrestrial laser scanning. Analysis

Georeferencing of the point cloud

was done with created for network of control points.

Some of them **were excluded** from the calculations in order to be obtained better quality results, fig. 3.

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Fig. 3 Quality results from georeferencing of the point cloud
7. Conclusion

The full digital model was not created in the “classical”, fast way (using artificial targets). The bushes imposed:

- replacement of target-based registration with registration using planes;
- three registrations using planes instead of application of target-based one;
- more computational time, required for registration using planes process.
- human decisions/intervention for the specific way of measurements and data processing.
7. Conclusion

It could be noted the high accuracy, which was obtained:

a) **1 mm** in the registration process;

b) **9 mm** in the georeferencing of the point cloud.
7. Conclusion

The data from this terrestrial laser scanning was represented in the plane.

The information was used for further geodetic activities. Based on:
- the geometry of the object;
- the technical difficulties (solved during the data processing);
- the taken decisions in the area of terrestrial laser scanning,

it could be noted, that the geodetic measurements were done in a reasonable time (due to the bad weather conditions) and excellent quality results were obtained.
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Thank you for your attention!

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