

TERESTRICAL LASER SCANNING APPLIED TO ANALYSES OF PUBLIC SPACES

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This paper introduces a system of terrestrial laser scanning as a part of an analysis of two different types of public spaces, one in the city of Nitra (Župné Námestie) and the other in rural Podhorany (a square connected to a street), presenting the system and advantages of the process. The obtained data were processed with Leica Cyclone software. After importing the data, RGB point values of the photographs that had been obtained with an internal camera scanner were assigned to all the scans. Point Cloud data gathered in Podhorany was registered manually, while Župné square in Nitra was scanned from a single stand-point, so no manual processing was necessary. Interactive documents, which offer opportunities to measure the distance, size and RGB values of various components of the places, were created from complex point clouds, with Leica TruView SiteMap being used to create such documents. The advantage of this technology is that it saves time, the application is simple and there is no need for terrain map documentation, measure-tapes, observations and data origination. It offers easy views, section monitoring and exactly shows the visual impact of various elements. Data are saved in memory and the values can be re-measured anytime, if necessary. It is also possible to create views in different perspectives or a precise image of a plan view in a very short time. Scanning technology records the current condition of spaces, though movement cannot be measured. Collected pictures and data show the actual condition, values and changes over time.

Keywords: terrestrial laser scanning, public spaces, analyses of public spaces

Introduction

A large bibliography that describes the topic of public spaces is available (Aghostin-Sangar, 2007; Gehl and Gemzoel, 2004; Gehl, 2010; Jacobs, 2010; Kristiánová 2011; Madanipour, 2003; Miková, Paulíková and Pauliniová, 2010; Šilhánková, 2008; Tilley, Šilhánková and Navrátilová, 1996). It is necessary to know the condition of a public space when creating it, so an analysis should be done. Data can be divided into exact measurable values (height, distance, traffic and values) and observed values (paths of pedestrians, qualitative values of the buildings, genius loci of the place, safety, quality of greenery...). Terrestrial scanning saves the most time, is accurate and the optimal methodology for gathering important information.

Material and methods

Scanning took place on 25th March, 2014 between, 12:00 noon and 2:00 pm. A Leica C10 laser scanner was used. Two types of public places were analyzed: one in the rural village of Podhorany – Sokolníky (a public square in front of the village church connected to a street for cars and pedestrians) and the other in the city of Nitra (Župné Square).

In order to choose optimal scanning positions, an initial reconnaissance of the selected area has to be done. In Podhorany three scanning positions were selected, while only position was used in the case of Župné Square.

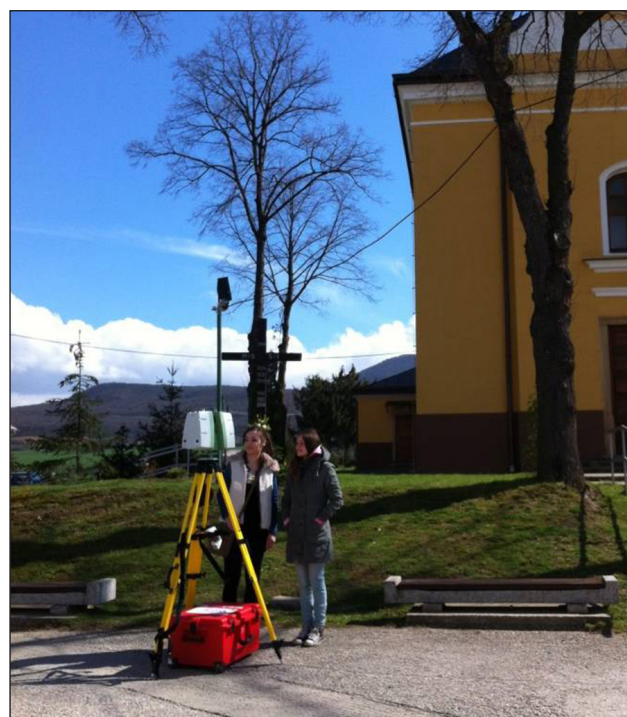


Figure 1 Scanning process

Field vision was set to H360° V270° and medium-quality density measurement was performed since this level of detail is sufficient for the needs of the areas to

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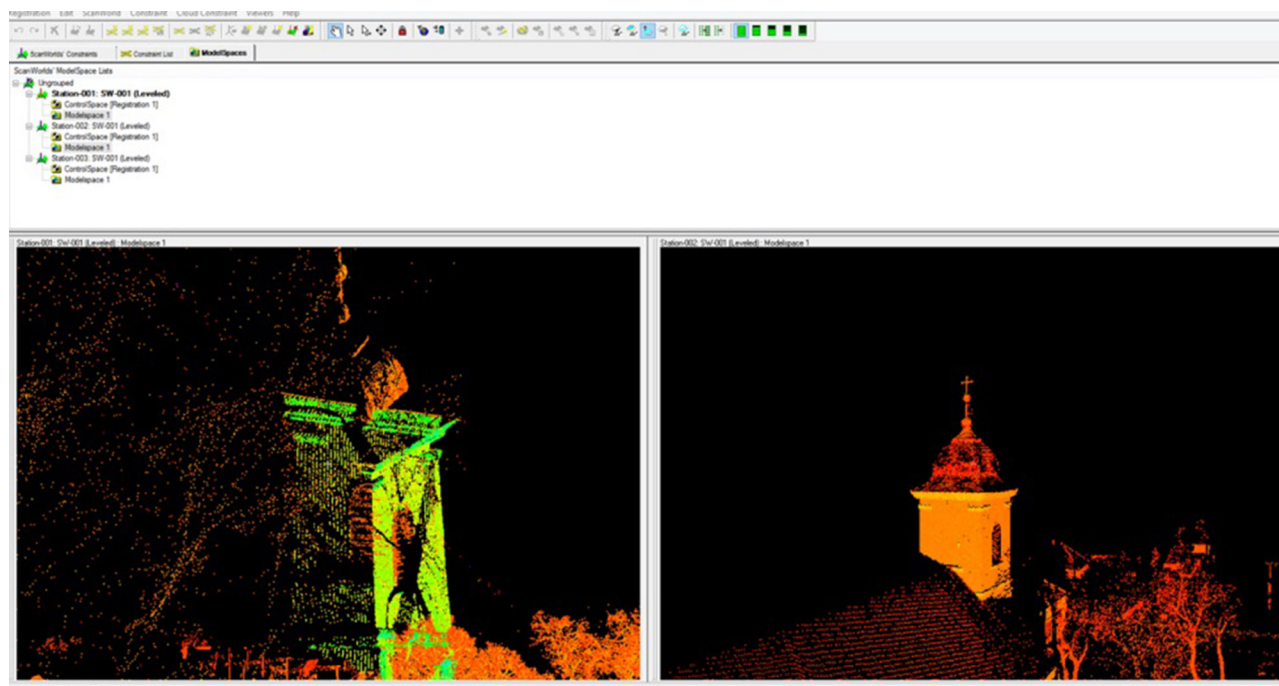


Figure 2 Manual registration of point clouds – common point – church tower

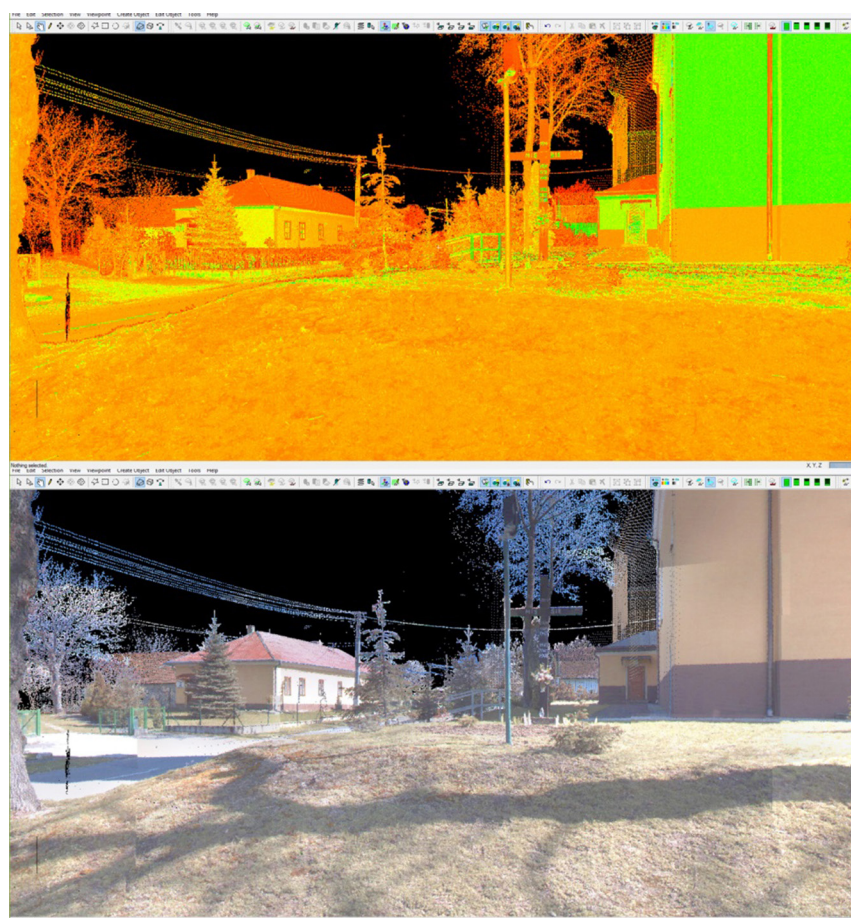


Figure 3 Point cloud without and with adding of RGB values (Podhorany)

be analyzed. Photos obtained with the scanner's internal camera were taken with an automatic exposure

setting. No HDS targets were used in the scanning, making the work considerably more efficient.

Terrestrial laser scanning is quite well known, working on the principle of detailed non-selective gathering of spatial data that is based on a spatial-polar method using a non-prism rangefinder. There are several options to process the obtained data (point clouds). In each case of processing, there has to be registration, which means transforming particular point clouds into a single grid system.

The obtained data were processed with Leica Cyclone software. After importing the data, RGB point values of the photographs acquired with an internal camera scanner were assigned to each camera scan. Point Cloud data gathered in Podhorany was registered manually. Joining the obtained data requires a determination of the common points in the space. In Podhorany, this was the church tower between the first and second standpoint, while the third standpoint was the corner of a office building. An absolute transformation error of 9 mm was generated. Župné Square in Nitra was scanned from one standpoint, so no manual processing necessary.

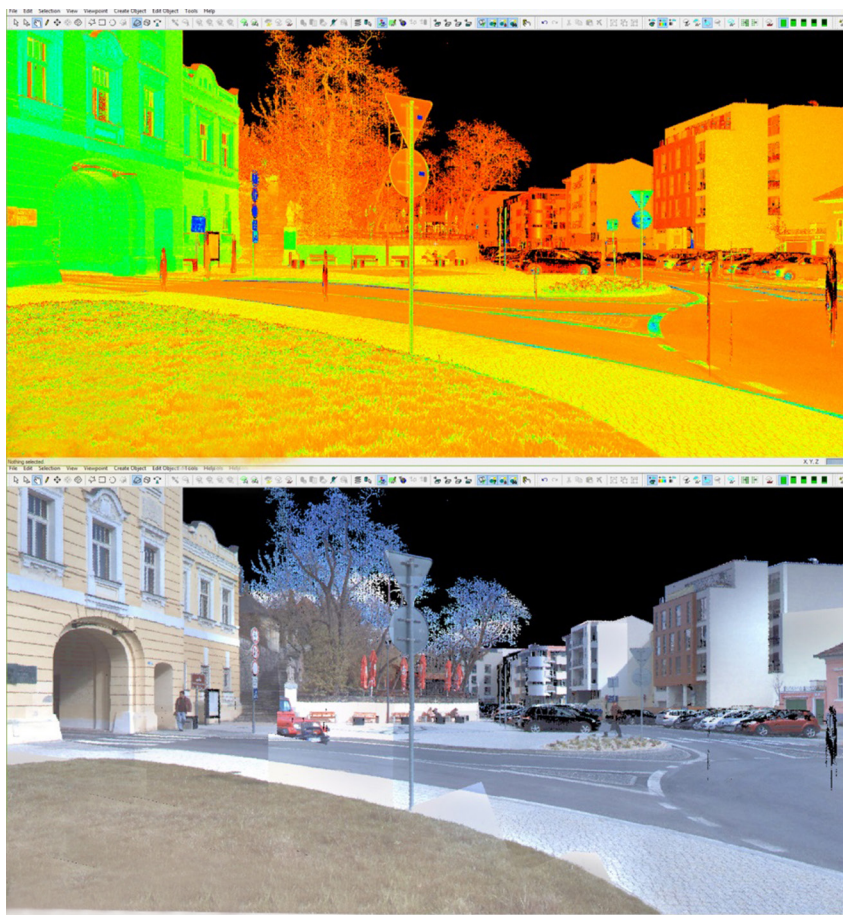


Figure 4 Point cloud without and with adding of RGB values (Župné Square)

Results and discussion

Documents in the form of an interactive view were created from complex point clouds. These views

can also be published online. The available data can be used to analyze public spaces with the option of measuring distances and sizes,

or of observing the RGB values of individual objects and views. Such data was created with a Leica TruView SiteMap application.

Techniques of gathering data for spatial analyses of public places and data for the architecture and buildings are diverse, where the difference is mainly in the level of detail.

Specific constructions requiring high accuracy is demanded for specific constructions and objects. The documents that are acquired are then used by structural engineers, restorers, historians and architects as materials. Analyzing public spaces does not demand such detailed materials. When scanning a public space in a city, a disadvantage is the presence of more disturbing elements (moving people and vehicles, rain) that leads to timeconsuming data filtration.

Conclusion

Terrestrial laser scanning was used to gather, analyze, process and evaluate data at two specific public spaces, one in the village of Podhorany village and the other at Župné Square in the city of Nitra. The advantage of this technology is that it saves time, the application is simple and there is no longer any need for terrain map

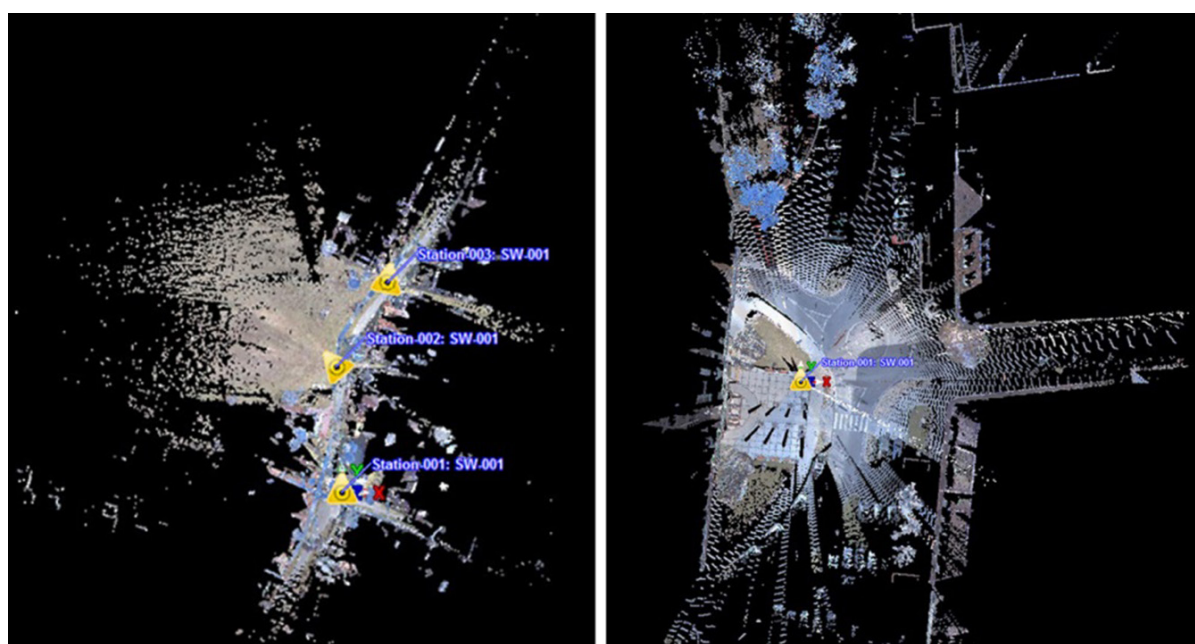


Figure 5 Site Map of partial scans (Podhorany, Župné Square)

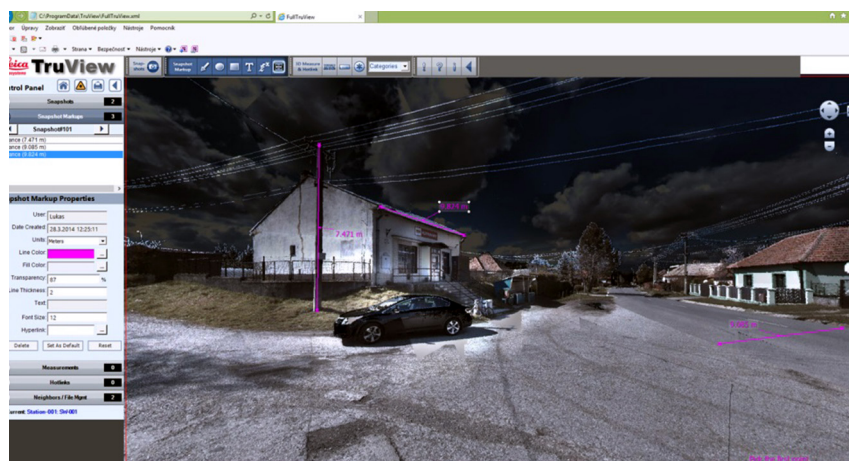


Figure 6 Interactive view with the option of distance measurement between particular points (Podhorany)

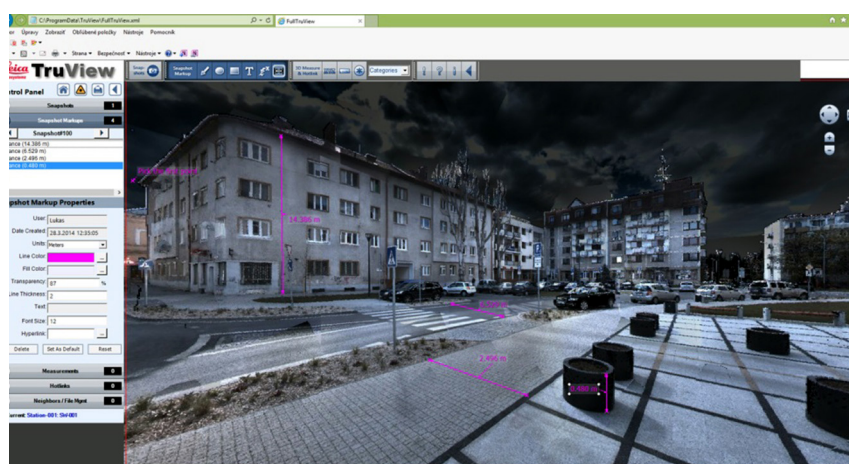


Figure 7 Interactive view with the option of distance measurement between particular points (Župné Square)

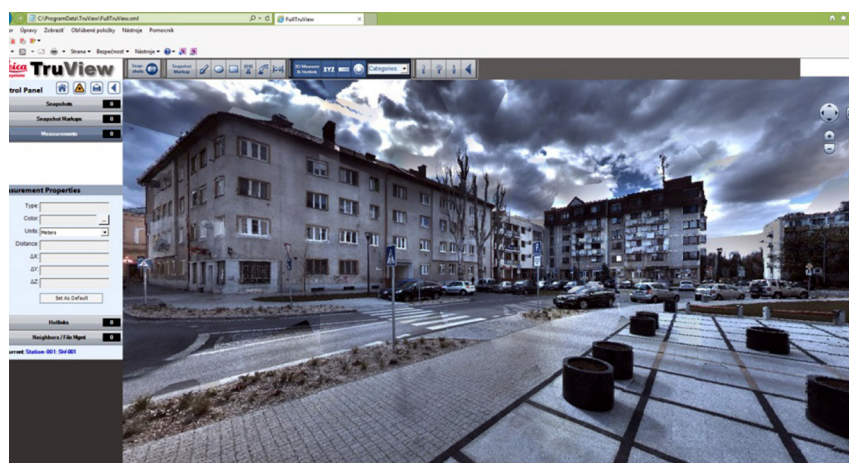


Figure 8 Heavy traffic at Župné Square

documentation, measuring tapes, observations and data origination. It offers easy views and section monitoring, exactly showing the visual impact of various elements on the space. Date can be obtained anytime

when is required. Data are saved in memory and can be re-measured any time when necessary. It is also possible to create views in different perspectives or a precise image of a plan view in a very short time.

Only an expert or trained engineer can work with the technology that has been described, so it is necessary to know and understand the process and the principle of data processing.

The technology records the current condition of the spaces. Movement cannot be measured with this application. The collected pictures and data show the actual condition, values and changes over time.

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