3D GIS SOLUTION APPLIED IN SURVEYING ENGINEERING

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In technical practice, there are gaining importance of technologies that are suitable for three-dimensional data collection. Outstanding among these is the strongly developing laserscanning solution.

These instruments take full advantage of the benefits of photogrammetry and laser measuring, but they are even more efficient thanks to their speed. The GIS applications have previously been dealt with the management and display of 3D data but in our profession they were handled more like 2.5D. This new type of data acquisitioned method requires new solution in processing and utilization as well.

During an industrial task we faced the problem how we can determine in the most efficient way the spatial geometry of a room crowded with electrical fittings, then how to implement a system where we can join attributes to the assemblies model's. In this work our job was to make laserscans of the specified rooms and at the second phase we worked outdoor and scanned the connecting facilities and the surrounding terrain. In every room we scanned from more than one station so we had to use targets to connect the discrete point clouds. The targets are special accessories for registration purposes. They allow for accurate geo-referencing of scans to known control points, accurate registration of multiple scans to each other. The minimal number of these control points are two, assuming that the instrument's compensator was active, but most cases we used more depending on the shape and size of the actual room. It would be possible to process discrete point clouds without any measured control points just by manually picking and using easily identifiable common scanned points on the consecutive point clouds but it would slow down the processing work. After connections between point clouds have been made room by room, the next step was to transform them to a common coordinate system to build the room-topology. For this step I needed the digital floor plan of plant, and well identifiable points on the point clouds and on the given plan. In some cases big differences revealed between the plan and the actual sizes of some rooms, but in most cases the differences stayed under 5cm. The following step was to make the models of the rooms and the facilities, to substitute the pointclouds with geometrical forms.

During the implementation we have used Leica scanstation instrument and for the data processing the Cyclon software developed by them. For the transformation process Cloudworx software were used to show the transformed pointcloud on the plan in AutoCAD.

The use of laserscanning can be indirectly compared to photogrammetric measures.

- During photo-surveying the aim is to produce 3D model using adequately overlapping static photos. So if we want to make a model we need at least two properly positioned images.

- Using laserscanning technology we can make model even using only one station's date, because every measured point coordinates are known. The point-could model of the measured objects can be viewed on site just after the scanning finished which has numerous advantages.
- Advantage of the laserscanning over the photogrammetry is that measures can be made even at bad lighting conditions it has significant effect only to the imaging function which used during the processing to give realistic color information to every measured points.

Additional advantages of laserscanning:

- Because we don’t have to approach the scanned objects we can avoid many potentially dangerous situations (electric shock, burns, frostbites, etc...)
- The measuring process doesn’t hold up the surrounding works, because the time of a measurement is relatively short, compared to some more traditional methods. It is especially important when measurements take place for example on an accident scene or during ongoing production or building process (e.g. crane measurements).
- The chance of repeated measurements reduced significantly thanks to the on-site pre-processing options some of which can be accessed without connecting external computer (laptop).

Some possible application of laser scanning:

- Internal, external building surveys to produce 3D model
- Street surveying without impending the traffic
- Rapid assessment of complex indoor technology systems (e.g. pipelines)
- Surveying of caves ravines
- Motion analysis of hardly accessible places, like bridges
- Air cable survey