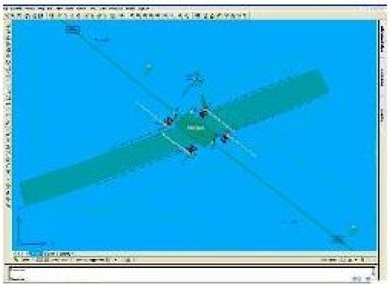
DATA COLLECTION OF RAILWAY OBJECTS

From Quick to Quality



The Hungarian railway network is 7,800km long. To support efficient management Hungarian State Railways (MÃV) started to resurvey the great variety of 400,000 railway objects in 2008. The author describes the survey strategy developed to overcome time and budget constraints of this nationwide project, which is still ongoing.

The Hungarian State Railways (MÁV), one of Hungary's largest enterprises, faced the challenge of collecting data of railway objects, such as tracks, bridges and signalling devices, within tight time and budget constraints. The collection of huge amounts of data of 300 types of objects had to be finalised within fourteen months. To optimise efficacy, a keen measurement strategy had to be designed with as general objective to minimise efforts in the field without compromising completeness and accuracy of the data.

GNSS
Up to 2009, MÁV used geodetic surveying as the primary data collection method, a quite slow method only allowing for maximum progress of one kilometre of railway line per day. Examining other methods revealed high precision GNSS as the winning alternative (Figure 1). GNSS is four times faster compared to geodetic surveying, provides appropriate input for efficient data processing, and, most importantly, measuring does not require thorough surveying expertise. MÁV has a marked shortage of geodetic professionals and outsourcing appeared to be four to five times more expensive than employing own personnel. Therefore, utilising equipment, which can be handled by non-professionals within the organisation, is very beneficial from a budget point of view. The required precision of one centimetre can be achieved because Hungary is well covered with a high precision GNSS control network. Real-time corrections are enabled through the availability of mobile phone networks covering 95% of the territory.

Teamwork
The most expensive error is missing an object because this forces the surveyor to revisit the field. The access time to remote areas can be several hours and is accordingly expensive. Within the newly developed methodology, we recognised that teams consisting only of surveying staff could easily miss some of the 300 different types of objects, some of which may sometimes be hidden from sight. Therefore, we adopted the strategy to involve staff of all six departments of MÁV, all of which use the data in their daily work, in the field surveys. Their main task is to identify objects, which appear hidden from the sight of the surveyor, prior to starting the measurements. Working as a team also allows short feedback time between surveying staff and data users in the case of errors occurring.

Quality Assurance
Data collection in the field is limited to the geometry of the objects, modelled as points, lines and polygons. Next, the data users of the MÁV departments assign one or more attributes to each object in the office, which again results in time savings. Prior to attribute assignment, the data as collected in the field is uploaded in a GIS, which is a largely automated process to minimise efforts. The data is organised in the GIS specific structure and proper relationships between the hierarchy of objects is established based on predefined rules. An example of what the data user sees on screen while performing attribute assignment is shown in Figure 2. After entry, the data is checked in a two-stage control procedure. In the first stage, personnel of the six departments check their own types of data independently in a parallel process. In the second stage, a senior expert performs an over-all check.
The control procedures are supported by a specially developed management programme, which controls deadlines, provides reports to the management and is able to handle 100 and more parallel processes.

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