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The Neglected Exactness

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Having a look into geophysical text books, you will find for all the described methods detailed lists of good practice. The variety of annotations specifies how to perform a reliable, trusty and plausible geophysical survey. Much space is used for considerations about all the necessary parameters like target depth, contrast, frequency, sampling, resolution and many other boundary conditions that account for a high quality report. But you will find rather fewer comments on locating and positioning. It seems to be self-evident in times of GNSS (Global Navigation Satellite Systems) and high performance laser total stations that positioning is a solved issue.

This seems to apply for all geophysical methods that operate at walking speed or slower and for typical geoscientific or environmental investigation sites like brownfields, wasteland or archaeological spots, usually of nearly rectangular size. Using of measuring tapes, ropes and ranging poles here is also good practice.

In civil engineering applications we observe lots of rectangular shaped inspection areas too but we as well get many linear structures like elongated bridge decks, dikes, railway tracks, runways and roads. Surveying of an archaeological place of 60 m by 82 m width requires a different positioning technology than surveying 5000 m along a highway although both sites have the same areal extent of around 5000 m^2. If we furthermore take into account that during the last years GPR evolved into one of the fastest investigation methods in geophysics, survey speed becomes an important item. While examining railway tracks or roads today it is common to make use of these high speed capabilities. GPR services are typically performed at speeds of 80 km/h or even with higher velocities.

Standard positioning methods do not longer apply to this problem. With speeds of more than 22 m/sec the internal latency of surveying systems gets quite relevant and even the effect of rounding within survey wheel systems is not negligible any more. Locating for example the exact position of joints, rebars on site, getting correct calibration information or overlaying measurements of independent methods requires high accuracy positioning for all data.

Different technologies of synchronizing and stabilizing are discussed in this presentation. Furthermore a scale problem for interdisciplinary work between the geotechnical engineer, the civil engineer, the surveyor and the geophysicist is presented. Manufacturers as well as users are addressed to work on a unified methodology that could be implemented in future.

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