

Monitoring Soil Movement using Low-Cost GNSS Equipment

For accurate positioning, a GNSS system is required that is able to either receive corrections from a base station with known coordinates in real-time (RTK) or add these corrections afterwards (PPK). Traditional survey-grade systems that provide these functionalities are very expensive and therefore not always suitable for all possible applications of high precision GNSS. Recently, low-cost alternatives are getting on the market which only cost a fraction of the price of high-end receivers, but promise to provide the same RTK functionalities as the expensive systems. Because of their small size and low cost, the possibilities to use high precision positioning are increasing.

One of the possible applications could be the permanent installment of a device to monitor vertical movements in the soil. These bottom changes are often in the order of centimeters or even millimeters, and could fluctuate on small time scales depending on the type of soil and the weather conditions (rainfall/drought, temperature). Traditionally vertical ground movement is determined by installing settlement rods and regularly measuring their position using high-end GNSS equipment, which is able to obtain the position with millimeter accuracy. However, in the period between measurements, the movement of the soil is not captured. Therefore, a constant measurement of vertical position is required to obtain a time series of the ground level development. Regular survey-grade GNSS equipment is often too expensive to be installed permanently at a single location, but low-cost GNSS receivers could be a solution for that.

Shore Monitoring & Research is looking for a bachelor or master student from TU Delft to investigate if such a monitoring technique can result in valuable information about soil settlements. This requires an affinity with **GNSS high-precision positioning**, but also working on **innovative** ways of data acquisition, **analysis** of these data and **creativity** to build the best possible set-up. The goal of this research is to optimize the accuracy of those low-cost GNSS systems (receiver and antenna) and determine if the positioning is accurate enough to capture these small scale vertical movements.

A test site was build in a Dutch meadow with peat ground to assess different methods of ground-level monitoring. The bottom elevation is regularly measured using leveling, extensometers, LiDAR and In-SAR. A setup of low-cost GNSS equipment is already made and records its position and sends it to the server. The student will use these data to analyze the performance and will try to optimize the current setup to achieve more accurate results. The data from all other monitoring methods can be used to validate the results of this RTK-Logger.

Does this sound like an interesting topic for your master thesis? Please contact us!

Contact

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