Total Station Remote Control with Mobile Phone

Graduate

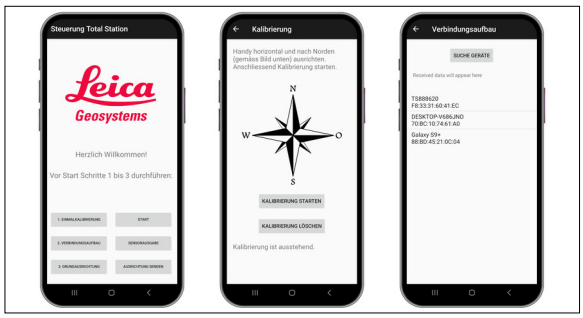
Siro Rutzer

Introduction: The bachelor thesis is concerned with the development and evaluation of an Android app to remotely control a robotic Total Station via Bluetooth. This work was carried out in collaboration with Leica Geosystems AG, a leading provider of surveying and geodetic instruments. The aim of the work was to use the sensors integrated in a cell phone, such as the Inertial Measurement Unit (IMU, acceleration and angular rate sensors), the compass or the GPS, to transfer the position of the cell phone to the Total Station and to align its telescope accordingly.

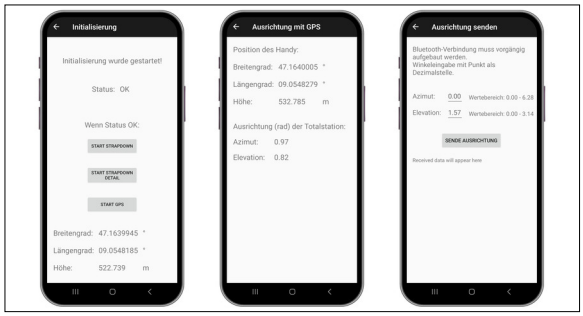
Approach / Technology: A central component of the work was the implementation of a strapdown algorithm that updates the navigation data by continuously integrating the sensor data. This makes it possible to precisely determine the current position and orientation of the cell phone. At the same time, a GPS-based positioning system was developed and implemented as an alternative method. Communication between the developed app and the total station takes place via a stable Bluetooth connection using the Leica GeoCOM protocol. To ensure user-friendliness, a graphical user interface (GUI) was designed that allows the user to easily operate the app and simultaneously displays the current position of the cell phone and the orientation of the total station.

Conclusion: It was found that the app developed represents a promising basis for future projects. Various test scenarios were developed to evaluate the app. The results of these tests show that the use of sensor data from a cell phone to control a total station is possible in principle. However, there are challenges, particularly with regard to the accuracy of the GPS signal and the stability of the strapdown algorithm.

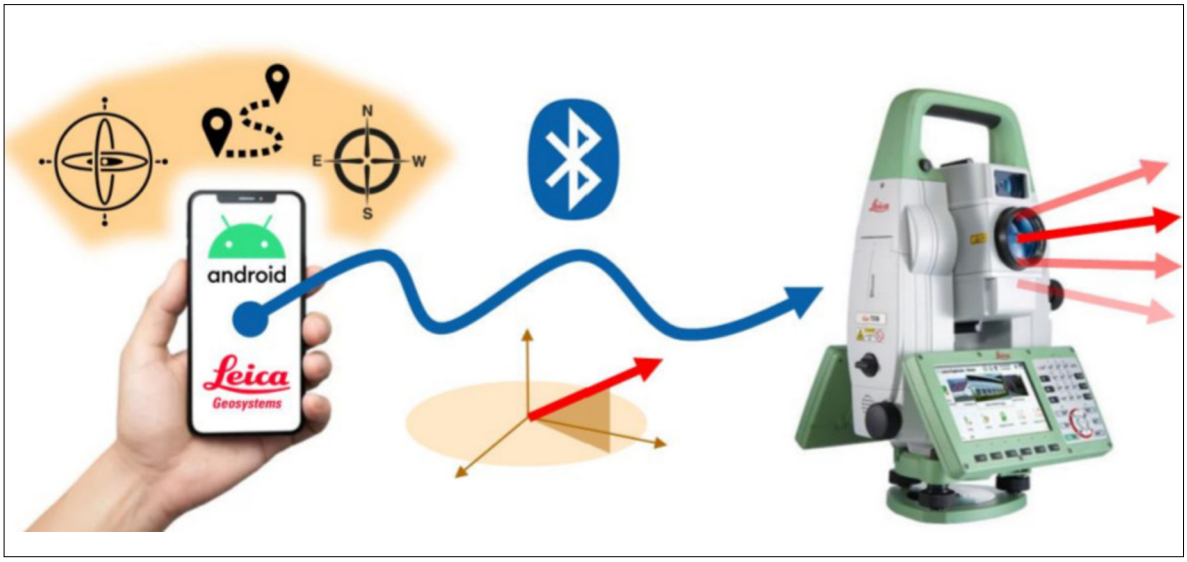
GUI: Main menu, calibration and connection setup
Own presentment



GUI: Initialization, running alignment and send any alignment
Own presentment



Overview
Leica Geosystems AG, Martin Mayer



Advisor
Prof. Dr. Hans Fritz

Co-Examiner
Prof. Dr. Carlo Bach

Subject Area
Computer Science

Project Partner
Leica Geosystems AG, Herbrugg, St. Gallen