Sensor System for Excavator Tasks Monitoring

Graduate

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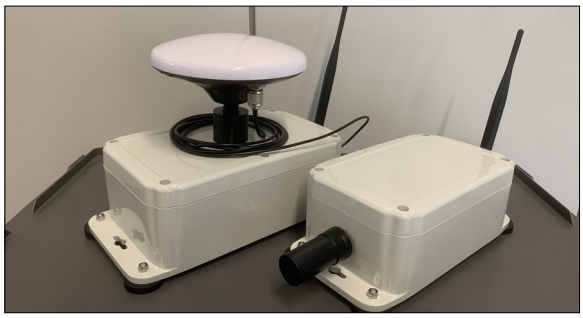
Introduction: Sersa Group AG offers a wide variety of products and services for railway infrastructure. To ensure reliable and high-quality order fulfilment, a manufacturer-independent sensor-based solution should be designed and implemented, which monitors the efficiency and productivity of their machine fleet. The positioning data and execution information of various construction or earthmoving activities must be acquired by sensors. The logged data is subsequently available and accessible via a web application. The information obtained can be used to analyse and if necessary, improve the operating strategies of various construction machines involved in the construction process. The monitoring system developed in the context of this thesis is intended to be fitted on an excavator. The sensor system should be capable of measuring the following:

- Position and orientation of the excavator
- Excavator-centred video footage of the tasks performed

Approach / Technology: To provide precise location positioning, a technique called real time kinematic (RTK) is being used. This involves two GNSS receivers. The first module configured as a “Rover” is mounted to a moving vehicle. Paired with a second module, the so-called “Base module”, which is stationary at a known location, the rover module can calculate its position with a precision up to one centimetre. This is accomplished by using the signals it receives from satellites and the correction data being received via radio link by the base station.

Result: The outcome of this thesis consists of two portable modules. Both modules are configured as a Rover. The first module, which will be mounted near the cabin of the excavator, is fitted with a GNSS receiver, a Jetson Nano for data processing, a camera and the antennas needed to receive the correction and satellite signals. The second module will be mounted on the arm of the excavator and consists of a GNSS receiver, a Bluetooth module and the required antennas.
The raw GPS data strings received by the second module are being sent to the main module via Bluetooth. The received data via Bluetooth and the local data parsed by the module placed on the cabin are being stored and processed on the Jetson nano with a script written in Python.
On the web application the parsed data, the distance and heading between both modules, a map with the plotted data and the camera feed can be accessed.

Hardware
Own presentment



Landing page of the web application
Own presentment

GPS data visualization
Own presentment

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Subject Area
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