

# UAV with Sensor Platform for Mine Detection

Nando Docci, Lukas Ostgen, Basil Ruch,  
Heinz Eichin

**FHNW Brugg-Windisch, University of Applied Sciences and Arts,  
Institute of Automation**

The major obstacle in mine detection is that the minefield must be entered. A new approach attempts to circumvent this situation with an unmanned aerial vehicle (UAV) system combined with a broadband ground penetration radar (GPR). This system is intended to be able to fly the mine area in a previously calculated flight route. The main target is to give a centimeter-exact evaluation of existing mines in this area for decreasing the costs of intensive "manual" search of landmines.

The goal was to construct a lightweight sensor-platform, which is independent from any possible UAV. The presented sensor platform can be divided in multiple subsystems. The most important subsystem is the GPR sensor system, for the detection of mines. Furthermore, the sensor platform consists of a single board computer (SBC) for recording and

synchronizing the measured values in a time-synchronized manner. Only if the position data exactly match the prevailing sensor data, a mine can be detected in a centimetre-accuracy. Especially for the GPR-system, there is the mechanical design with the gimbal, which is responsible for the regulation of the antennas.

For the low-cost UAV-system we use a modified, commercial available UAV with a Pixhawk flight controller. Depending on the high accuracy, we use a low cost RTK-System including a base antenna (stationary on the ground) and the rover antenna (mounted on top of the UAV). The RTK-system processing the both received GNSS-signals and calculating the position with a high relatively centimeter-accuracy.

Depending for the different sensor-systems (GPR, imagery-based sensors, etc.)

there are different flight missions required. Therefore, we programmed a mission-planning-software, which calculates the waypoints depending on a calculated elevation-model including obstacles like poles or trees and the used sensor.

As introduction, a brief overview of the overall system of the UAV based sensor platform and the UAV itself is given. Moreover, the individual subsystems and their difficulties are discussed.