



Combining of both RPAS and GPR methods for documentation and verifying of archaeological objects

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UAV (unmanned aircraft vehicle) or RPAS (remote piloted aircraft systems) are a modern technology for non – contact mapping and monitoring small areas. Nowadays, for control and piloting, RPAS are equipped with sophisticated micro-instruments such as IMU, gyroscopes, GNSS receivers, wireless image insights, wireless controls, automatic stabilization, flight planners, etc. RPAS can provide not only photographic data, but also other data types like multispectral (with NDVI capability), thermal data too (depending on sensors and type). Bigger RPAS can be equipped with more complex and expensive instruments like laser scanners or hyperspectral scanners. The RPAS method of acquisition combines the benefits of close range and aerial photogrammetry. As a result, a higher resolution and mapping precision can be obtained over compact and possibly less accessible areas (e.g. mountains, moors, swamps, dumps, small natural reserves, archaeological areas and dangerous or restricted areas). In our project, many small archaeological places are monitored. It is low cost, simple, and speedy. From these photos, a DSM (digital surface model) and orthophoto can be derived, which are useful for archaeologists (DSM is often used in shaded relief form). Based on the type of processing software, a textured virtual model can be obtained. Near infrared photos from height 100-200m give a new possibility in archaeology.

We used both RPAS and GPR methods in three case projects in the Czech Republic in 2014.

1. Historical field fortification

In the neighbourhood of town Litoměřice, there are still visible ramparts from the Prussian – Austrian war in the 19th Century. This was a field forward fortification, but has never been used in battle and later disappeared because of agricultural activities. Some parts are detectable by their terrain signatures, visible on shaded DSMs. By the documentation and research of these relics, we measured profiles with GPR for verifying of parts, which were visible on near-infrared photos. The photographed area has about 50 hectares with a rectangular shape; the flight height was 130m, with a pixel size of 4cm. Both NIR and VIS cameras were used.

2. Unknown historical construction in landscape

Near the small Lipany village is a probably medieval linear formation (mound), now hardly recognizable after several cultivations of the local fields. This mound was located using RPAS and verified by ground penetrating radar (SIR 3000). The results of GPR on pre defined areas from RPAS were very good. The photographed area has about 50 hectares with a very elongated rectangular shape 550x100m).

3. Possible newly detected archaeological objects

Near the town of Louny, on the peninsula that forms the river Eger, photographing was performed using RPAS. On the infrared photographs, near the uncovered archaeological digs, new unknown objects have been detected. In the spring 2015, we will continue with the verification findings using GPR.

The article will be focused on methods and results from above mentioned case projects.