

Feasibility Study of the Use of Bathymetric Surface Modelling Techniques for Intertidal Zones of Beaches

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SUMMARY

This paper elaborates on the use of different 3D data acquisition techniques for the construction of Digital Surface Models (DSMs) of intertidal zones of beaches to detect archaeological relicts. DSMs are an indispensable tool for the development and sustainable management of cultural heritage and archaeological relicts and in many applications, these models are used for the analysis of existing archaeological features or the detection of new features. This is also the case in the presented project on archaeological research in the Belgian North Sea. Obtaining a sufficient resolution and accuracy for these models is a challenging task, especially for intertidal zones of beaches. Specific difficulties in these transitional areas require a thorough study of available spatial data acquisition techniques, focussing on the various system properties and measurement methods. In general, bathymetric techniques make use of different approaches compared with topographic techniques, like the use of acoustic versus electromagnetic signals for distance measurements. The limited draft of intertidal zones, as well as the turbidity and tempestuous weather conditions are additional limiting factors for the Belgian North Sea coast. Different data acquisition techniques are discussed in this contribution: Airborne Laser Scanning (ALS) from a flying platform, Airborne Laser Bathymetry (ALB) as a combination of ALS with a water penetrating electromagnetic signal, Static Terrestrial Laser Scanning (STLS) (scanning from a fixed position on the ground), Mobile Terrestrial Laser Scanning (MTLS) (terrestrial laser scanner mounted on a driving platform). Moreover, image based reconstruction techniques and conventional topographic techniques, like a total station and Global Navigation Satellite System (GNSS), are discussed. These techniques are selected based on a required ground resolution of at least one metre and an vertical accuracy of at least twenty-five centimetre. A field campaign was organized at the intertidal zone of the beach of Raversijde (Belgium) in the early summer of 2013. Various techniques were deployed during this campaign in order to define the advantages and disadvantages for archaeological research. Based on this study, the use of MTLS appears to be very useful for the construction of the required DSMs. An ARGO, which is an amphibious vehicle, was used in combination with a series of positioning and orientation sensors (GNSS, INS,...). Using this system, the requirements concerning the resolution and accuracy were respected. Besides, the ARGO enables a fast and flexible usability, which is important for the varying weather conditions and tide. As a result, further development of het ARGO based acquisition platform is planned and additional campaigns

for a more extensive systematic surface modelling of the intertidal zones of the Belgian North Sea coast will be organised.