Noise Reduction Algorithm for Mobile LiDAR Data of Sand Ripples in Intertidal Zones of Beaches

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SUMMARY

For a geometric reconstruction of beaches one could apply a static scanning method. Although this kind of mapping results in very precise data, scanning by means of a mobile platform significantly reduces the data acquisition time. For the interdisciplinary research project SeArch, which aims at documenting archaeological patrimony in the Belgian North Sea, some intertidal zones near Ostend (Belgium) were scanned using a kinematic platform. A Terrestrial Laser Scanner (TLS), a Real-Time Kinematic Global Navigation Satellite System (RTK GNSS) and an Inertial Measurement Unit (IMU) were placed on an amphibious vehicle (ARGO). The intensity of the laser beam which reflected on the sand as well as the derived geometry was used to chart the beach's micro-relief. Such a map of very small height differences offers the possibility to detect morphological characteristics of sand transport and the possible presence of archaeologic structures beneath the beach surface.

An unavoidable and unwanted side-effect of data acquisition using a laser scanner is the inclusion of noise in the point cloud. In this paper, an algorithm which filters noise of mobile LiDAR data on beach strips measurements in the intertidal zone will be discussed. This noise removal had to be performed in an efficient, non-time consuming and precise way. The filtering is based on statistics, considering physical characteristics of micro-relief such as sand ripples. Besides, unwanted structures such as dykes and breakwaters had to be removed automatically from the data. The presented noise reduction script appeared very effective for both the noise elimination as for the extraction of the micro-relief features.