Creating an online grain size estimator based on hopper sensor data and iterative hopper settling models

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Challenge the future

CREATING AN ONLINE GRAIN SIZE ESTIMATOR BASED ON HOPPER SENSOR DATA AND ITERATIVE HOPPER SETTLING MODELS

by

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ABSTRACT

This research focuses on the development and feasibility of an online grain size estimator for a trailing suction hopper dredger (TSHD), based on the mass balance within a hopper, and using hopper settling models. The idea of the grain size estimator is to use existing hopper settling models iteratively for a certain time window with 'online' sensor input and different soil inputs. The resulting loading graphs are compared to the measured loading graphs, after which the most probable soil type is indicated.

This research is a continuation of the research of Strooker (2017) where not only the mass balance within a hopper, but also different occurring processes were taken into account. The grain size estimator developed for this research, is solely based on the mass balance within a hopper, and is focused on selecting a suitable hopper settling model, simulating a great amount of trips of various projects and interpreting the results.

The research shows that the Modified Camp model performed well in validating the hopper settling model and was therefore chosen to be implemented into the grain size estimator. After determining the limitations of the estimator, two projects and two vessels were used to simulate 1500+ trips in total with the available sensor data. The results are presented visually in different ways and compared to the measured soil model of the considered project. It is concluded that at one project (Liverpool), there are multiple areas where the results of the grain size estimator clearly matched the soil model. The second project (Kaohsiung) showed less conclusive results. It seems that the results of both the first part of each trip as well as the whole trip, produces results where the areas of soil are best distinguishable. The time window for where the soil type is determined also affects the accuracy and reliability. Longer time windows mean less accuracy, but a more reliable result. The accuracy was found to be only changing slightly between time windows of 30-600 seconds, but the reliability of the model is difficult to quantify.