HAZIQ AMZAR JUHARI

BACHELOR OF SURVEYING SCIENCE AND GEOMATICS (HONOURS)

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THE EFFECT OF SLOPE IN MULTIBEAM BACKSCATTER CLASSIFICATION MAP

MUHAMMAD HAZIQ AMZAR BIN JUHARI

2020869534

COLLEGE OF BUILT ENVIRONMENT

UNIVERSITI TEKNOLOGI MARA

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MUHAMMAD HAZIQ AMZAR BIN JUHARI

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Under - Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

Name of Student	:	Muhammad Haziq Amzar Bin Juhari
Student I.D. No.	:	2020869534
Programme	:	Bachelors in surveying science and geomatics – AP220
Faculty	:	College of Built Environment, CBE
Thesis Title	:	The Effect of Slope in Multibeam Backscatter Classification Map.
Signature of Student	:	……..
Date	:	AUGUST 2023

ABSTRACT

Recent advancements have led to a surge in the use of Multibeam Echo Sounder Systems (MBES) to harness backscatter data for creating seabed sediment classification maps. One critical aspect of this research has been examining the impact of different slope resolutions on these maps, which necessitates the effective derivation of seabed slope to ensure accurate backscatter readings. This study delves into the influence of slope resolution on seabed sediment characterization, focusing on its impact on the classification map's accuracy. Using a dataset composed of backscatter, bathymetry, and slope derivative, this study employed a supervised Random Tree Classification to generate a sediment classification map. The classification's accuracy was evaluated using user accuracy, overall accuracy, and kappa accuracy metrics. Computed the seafloor slope for bathymetric grids at varying resolutions (0.5m, 1m, 2m) and assessed the impact of grid cell size on slope values across. Notably that a lower standard deviation at each resolution contributed to more consistent and stable datasets. Conversely, larger grid cell sizes led to a decrease in slope values, reducing the detail and information yielded from slope estimates. Particularly, the standard deviation of slope values for a 0.5m grid cell size, in smooth and rough areas, outpaced those for 1m and 2m cell sizes. The correlation analysis between backscatter strength and slope gradient reveals significant differences across the three sediment types. The strongest relationship is observed in clay, followed by silt, and sand has the weakest relationship. The kappa accuracies for the sediment classification maps were 0.198 for 0.5m, 0.177 for 1m, and 0.173 for 2m resolutions. For overall accuracy, 0.5 m produce 0.47917, 1 m is 0.47917 and 2 m is 0.51042. This data suggests that smaller grid cell sizes foster higher accuracy classification maps, confirming the potential for seabed sediment characterization based on diverse resolutions of MBES measurements.

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