UNIVERSITI TEKNOLOGI MARA

# SHALLOW-WATER MAPPING AT PANTAI TOK JEMBAL, TERENGGANU, MALAYSIA, USING LANDSAT 8 (OLI)

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MSc

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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 Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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# ABSTRACT

Open-source availability data with various types of sensors, the variety of simple to the sophisticated algorithm, and readily available software with a specialized image analysis tool are among the attractive options by Satellite-Derived Bathymetry (SDB). Therefore, this study will use the SDB technique to extend the bathymetric survey area at Pantai Tok Jembal Terengganu, Malaysia. The size of the extended survey area is 49.69 $km^2$. The problem encountered during the bathymetry derivation process, related to the space, distribution and quantity of the Single-beam echo sounder (SBES) data. Therefore, the idea of using spatial interpolation could be a suitable approach in solving the problems. Next, there are three research objectives guideline in this study: i) to identify the best empirical-based method for Satellite-Derived Bathymetry, ii) to evaluate the spatial interpolation technique for generating a calibration dataset and iii) to evaluate the accuracy of Satellite-Derived Bathymetry using the selected empirical-based method and spatial interpolation technique. Then, three processes conducted in this study: Process A, B and C connecting to the research objective. First, Process A will identify the best empirical-based method among the six method use: Single Band Algorithm for blue band (SBA-Blue), Single Band Algorithm for green band (SBA-Green), Green Band Algorithm (GBA), Principal Component Analysis (PCA), Independent Component Analysis (ICA), and Log-ratio Transform (LR) and utilizing three types of atmospheric correction approaches, namely, no atmospheric correction, Dark Object Subtraction (DOS), and Fast Line-of-sight Atmospheric Analysis of Hypercubes (FLAASH), to diversify the SDB quality result. Second, Process B produces an Improvised Calibration dataset using six spatial interpolations: Inverse Distance Weightage (IDW), Universal Kriging (KRG), Thin-plate Spline (TPS), Spline with Tension (ST), Natural Neighbour (NN), and Topo to Raster (T2R). Third, Process C will generate an Improvised SDB, using the ICD generated under Process B and the selected empirical-based method (identify in Process A). The selected method is LR perform with DOS, which applies under Process C. A comparative analysis conducted between the six Improvised SDB results, and the best result is SDB-KRG, which produce the lowest RMSE (0.718 m).To presume that SDB is suitable for extending the bathymetric survey area or filling the data gaps. However, on the condition, the depth must not be up to 20 m. The extinction of light as depth goes deeper consequently produces erroneous depth. It is better to use higher resolution images to give comprehensive bathymetry information better in filling the data gaps. Besides, SDB has an excellent positional accuracy similar to MBES and SBES and better than LiDAR. However, the accuracy of SDB is not good as MBES and SBES. Nonetheless, there is still room for improvement, a great motivation through the success of EOMAP in the Great Barrier Reef mapping, the world most extensive mapping using SDB technique, which this area has never been surveying due to the extensive coral reef.

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