INTEGRATING MULTIBEAM ECHO SOUNDER AND SATELLITE-DERIVED BATHYMETRY FOR MAPPING OF SHALLOW COASTAL WATER

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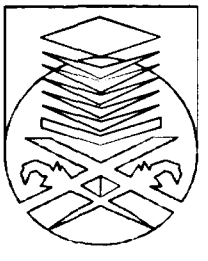

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ABSTRACT

Echosounders are the most used depth acquisition equipments in bathymetry surveys. Despite its widespread usage, the vessels that are equipped with echosounders and their necessary components are not able to enter certain areas where the water depth is too shallow. This is due to the risk of vessel and equipment damage. An advancement in depth acquisition methods, which is the satellite-derived bathymetry, can estimate the depths of shallow waters (usually coastal waters) through specific parameters. In this study, a bathymetry map of the waters surrounding Coral Island is generated with the integration of bathymetry that was obtained from echosounding survey and satellite image. The data used for this study are secondary data that were obtained from government agencies and were then further processed in specialized softwares. The results from the data processing stage were then analysed by assessing the accuracy and fit between the depths derived from MBES and satellite image to determine the best result to be used to establish a bathymetry map derived from satellite imagery. The final output of this study is the integrated bathymetry map, which was an integration of the depths derived from MBES and satellite image.

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CHAPTER 1

INTRODUCTION

1.1 Background Study

Shallow coastal water environments are highly essential for various marine ecosystems and the coastal communities. Mapping out these environments is vital in order to understand their physical and biological processes, identify potential hazards, and the management of resources. Echosounders are the most used survey equipment for conducting bathymetric surveys (Igbinenikaro et al., 2024). Despite the capabilities of echosounders to derive bathymetric data, echosounders are held back by its high cost of operations and inefficiency when conducting bathymetric surveys on shallow waters (Gao, 2009). To overcome this, an alternative method to derive the depths of shallow coastal waters is through satellite-derived bathymetry. The usage of satellite-derived bathymetry has increased in the past ten years or so due to the emergence of multi-constellation, multi-temporal, and multi resolution satellite images that are available to be downloaded from online sources (Poliyapram et al., 2017).

Satellite-derived bathymetry, shortened as SDB, is a remote sensing technology that utilizes satellite imagery to estimate the water depths based on the properties of the water columns. The usage of satellite imagery to derive bathymetric depths has been studied ever since the 1970s (Mavraeidopoulos et al., 2017). SDB is a technology that provides a broad spatial coverage, making it suitable for large-scale mapping applications. SDB has been coined as a promising and attractive technology in hydrographic survey for mapping the seafloor environments of shallow waters (Said et al., 2017). SDB may be insufficient for bathymetric mapping of certain water environments, especially waters with deeper depths (Thomas et al., 2021) than the typical nearshore waters, which are often shallow and offers more light penetration.