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BUILDING FOOTPRINT EXTRACTION USING MULTI-RESOLUTION SEGMENTATION AND SUPPORT VECTOR MACHINE CLASSIFICATION IN UiTM PERLIS

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Thesis submitted to the Universiti Teknologi MARA Malaysia
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DECLARATION

I declare that the work on this project/dissertation was carried out in accordance with the regulations of Universiti Teknologi MARA (UiTM). This project/dissertation is original, and it is the result of my work, unless otherwise indicated or acknowledged as referenced work.

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I certify that I have examined the student's work and found that they are in accordance with the rules and regulations of the School and University and fulfils the requirements for the award of the degree of Bachelor of Surveying Science and Geomatics (Honours).

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ABSTRACT

Accurate and automated building footprint extraction from high-resolution aerial or satellite imagery is a critical task with numerous applications in urban planning, disaster management, and more. Nevertheless, traditional object-based classification methods often encounter challenges when delineating complex building outlines, especially in scenarios with irregular shapes, or complex roof structures. The aim of this study is to analyse the accuracy of building footprint extraction from high-resolution aerial imagery through the utilization of Multi-Resolution Segmentation and Support Vector Machine Classification. Firstly, the image segmentation was applied on the image, resulted in the formation of the different levels of polygon primitives. Then, SVM classification was utilized to classify buildings from other classes in the image. Finally, the verification was determined by comparing the extraction to Global Navigation Satellite System (GNSS) data and footprints extracted from Light Detection and Ranging (LiDAR) dataset. The MRS was able to segment the buildings appropriately while the SVM classifier provided such an accurate classification which the overall accuracy and kappa coefficient obtained were 85% and 0.785 respectively. Based on the accuracy assessment, the techniques used in this study was able to provide reliable the data of buildings footprints which the tolerance of differences in length measurements does not exceed than two (2) meters of accuracy. Specifically, the differences between measurement from UAV and GNSS measurement recorded the lowest differences which is 0.003 meter while the highest was 1.373 meter. Meanwhile, the differences compared to the extracted measurement from LiDAR recorded 1.699 meter for the highest and 0.008 meter for the lowest. However, improvements such an integration with other techniques such as advanced machine, deep learning and artificial intelligence (AI) were suggested to enhance the data precision and accuracy in the future research and studies.

Keywords: Remote Sensing; Feature Extraction; Multi-Resolution Segmentation; Building Footprint; Support Vector Machine; Unmanned Aerial Vehicle

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