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CONCRETE SURFACE INSPECTION BY USING UNMANNED AERIAL VEHICLE (UAV) AND DEEP LEARNING ALGORITHMS YOLOv7

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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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ABSTRACT

Concrete surface inspection is a critical aspect of infrastructure maintenance, traditionally performed through manual methods that are time-consuming, labour-intensive, and prone to human error. This research aims to improve the detection and analysis of cracks on concrete surfaces by utilizing Uavs and yolo algorithms. Uavs offer a versatile and cost-effective solution for capturing high-resolution orthophotos of large and hard-to-reach concrete structures. These images are then processed using yolov7, a state-of-the-art object detection algorithm, to accurately identify and classify surface cracks. the study involves the collection of a comprehensive dataset of concrete surfaces with varying crack patterns, pre-processed using Roboflow and Opencv tools to enhance crack features. the annotated dataset is utilized to train and validate the yolov7 model, ensuring high precision which is 96.8% and 90.1% recall in crack detection. the performance of the model is evaluated through metrics such as precision, recall, and f1-score, demonstrating its robustness and reliability in detecting both fine and prominent cracks. The results indicate that the combined use of Uavs and yolov7 significantly improves the efficiency of concrete surface inspections, providing a scalable and automated solution for infrastructure monitoring. This research contributes to the field of automated infrastructure inspection by integrating Uav technology with advanced deep learning algorithms, presenting a novel approach that reduces manual effort and enhances the accuracy of concrete surface assessments. The findings suggest potential applications in various fields including geomatic fields emphasizing the importance of technological advancements in maintaining the safety and longevity of critical infrastructure.

***Keywords**:* Concrete Surface Inspection, Unmanned Aerial Vehicles (UAVs), YOLOv7, Deep Learning, Crack Detection, Image Processing, Infrastructure Maintenance

TABLE OF CONTENTS