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Development of drone-based computer vision-assisted pavement distress detection (Phase 3)

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Abstract: Road inspection monitors distress progression and detects surface deterioration, which equips timely maintenance that extends the service life of transportation infrastructure. However, most UAV-based automated systems are optimized for structured environments and struggle with unstructured roads—common in developing countries—due to missing lane markings, irregular surfaces, inconsistent signage, and frequent visual obstructions. The key contribution of this project lies in its focus on unstructured roads, particularly those in developing countries where unique challenges such as combined asphalt-concrete lanes are prevalent. Thus, in Phase 3, we refined our pavement management system to align with standard practices which primarily identify pavement panels as either concrete or asphalt. We increased our dataset to include a new set of distresses, such as cracking (transverse, longitudinal, and crocodile), wearing surface (rutting, bleeding, and flushing), edge breaks, potholes (base failure and surface failure), patches, and joint defects. Then, we developed a strategy to localize distressed panels in the map and grade their severity. Lastly, we created a web application that can perform standard evaluation procedures and provide Artificial Intelligence-driven recommendations. The implementations of several features are still ongoing.

Key Words: Aerial Systems: Applications; Automation Technologies for Smart Cities; Computer Vision for Transportation; Deep Learning Methods; Object Detection, Segmentation, and Categorization

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