SIMULASI *HEADING QUADCOPTER DRONE* DALAM PEMANTAUAN POSISI LUMBA-LUMBA PADA CITRA UAV BERBASIS U-NET

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ABSTRAK

Tur Lumba-lumba merupakan Wisata Bahari Unik yang terdapat di Lovina, Kalibukbuk, Bali. Sebagai wisata alam, kemunculan lumba-lumba tidak dapat dijanjikan karena posisi lumba-lumba tidak diketahui secara pasti. Ini mengakibatkan proses penelusuran lumba-lumba memakan waktu hingga 3 jam. Tujuan dari penelitian ini untuk mengembangkan aplikasi simulasi *heading quadcopter drone* dalam misi memantau posisi kemunculan lumba-lumba melalui segmentasi objek pada Citra UAV berbasis U-Net. Metode yang diusulkan terdiri dari tahap finalisasi *dataset*, *data preparation*, pembangunan model segmentasi, dan pengaplikasian model segmentasi. *Dataset* yang digunakan pada penelitian ini berjumlah 1400 citra yang dibagi menjadi *Training* 80% (1.120 citra), *Validation* 10% (140 citra), *Test* 10% (140 citra). Melalui penelitian ini, Model U-Net dengan *Jaccard Loss* menghasilkan *Pixel Accuracy* 99.8%, *F1-Score* 83.2%, *Mean IoU/Jaccard* 86.2%, *Recall* 90.9%, dan *Precision* 78.9% dengan durasi rerata komputasi 0.14 detik pada GPU RTX 3070; sedangkan evaluasi derajat *heading quadcopter drone* menghasilkan rerata selisih derajat sebesar 10,893° dan Nilai *Mean Absolute Error Percentage* (MAPE) 10.82% dengan kategori baik.

Kata-kata kunci: segmentasi citra, lumba-lumba, Citra UAV, U-Net, CNN*, deep learning*

QUADCOPTER DRONE HEADING SIMULATION IN DOLPHIN POSITION MONITORING ON U-NET BASED UAV IMAGE

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ABSTRACT

Dolphin Tour is a Unique Marine Tourism located in Lovina, Kalibukbuk, Bali. As natural tourism, the appearance of dolphins cannot be promised because the position of the dolphins is not known with certainty. This resulted in the dolphin tracking process taking up to 3 hours. The purpose of this research is to develop a quadcopter drone heading simulation application in a mission to monitor the position of dolphins through object segmentation on U-Net based UAV imagery. The proposed method consists of dataset finalization, data preparation, segmentation model development, and segmentation model application. The dataset used in this research totaled 1400 images which were divided into Training 80% (1120 images), Validation 10% (140 images), Test 10% (140 images). Through this research, the U-Net model with Jaccard Loss produces Pixel Accuracy 99.8%, F1-Score 83.2%, Mean IoU/Jaccard 86.2%, Recall 90.9%, and Precision 78.9% with an average computation time of 0.14 seconds on the GPU RTX 3070; The evaluation of the degree of heading of the quadcopter drone produces an average difference in degrees of 10.893° and a Mean Absolute Error Percentage (MAPE) value of 10.82% in the good category.

Keywords: image segmentation, dolphin, UAV Imagery, U-Net, CNN, deep learning