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Implementasi dan Analisis Kinerja Aplikasi PDU Stone Monitoring Berbasis Computer Vision pada PT Parama Data Unit
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INTISARI

IMPLEMENTASI DAN ANALISIS KINERJA APLIKASI *PDU STONE MONITORING* BERBASIS *COMPUTER VISION* PADA PT PARAMA DATA UNIT

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Computer vision merupakan bidang kecerdasan buatan yang memungkinkan sistem menganalisis dan menginterpretasikan citra digital secara otomatis. Proyek akhir ini mengimplementasikan sistem monitoring *drill cuttings* pada unit *shale shaker* menggunakan model segmentasi DeepLabV3+ dengan tiga variasi *backbone*, yaitu MobileNetV3, ResNet50, dan ResNet101, yang diintegrasikan pada aplikasi desktop dan sistem VPS untuk mendukung pemantauan secara *real-time* di PT Parama Data Unit. Pengujian mencakup evaluasi model, *Quality of Service* (QoS) jalur RTSP dan VPS, serta performa server dalam menjalankan *inference*. Hasil evaluasi model menunjukkan ResNet101 memperoleh mIoU tertinggi sebesar 87,01%, sementara MobileNetV3 mencatat waktu *inference* tercepat 37,20 ms atau 6,86 kali lebih cepat dibandingkan ResNet101 sebesar 255,16 ms. Pengujian QoS jalur RTSP menghasilkan *throughput* di atas minimum *bitrate* kamera dalam menjalankan 30*fps stream*. *Packet loss* pada jaringan lokal mendekati 0%, sedangkan jaringan publik mendapatkan 22% karena tidak adanya mekanisme *retransmission* yang berjalan pada UDP. *Inter-packet delay* seluruh jaringan menghasilkan nilai sangat baik pada rentang 6–8 ms. Pengujian QoS VPS menghasilkan *throughput* sistem yang tidak membebani *bandwidth* jaringan pada penggunaan 0,3–0,5%. *Packet loss* mendapatkan hasil di bawah 0,5% karena adanya mekanisme *retransmission* pada TCP. *Delay* mendapatkan hasil yang sangat baik di bawah 150 ms. Evaluasi performa server menunjukkan MobileNetV3 paling efisien dengan penggunaan CPU 22,9%, dibandingkan ResNet50 (81,8%) dan ResNet101 (93,3%). Sistem berhasil mendukung monitoring real-time secara stabil, efisien, dan terintegrasi.

Kata kunci: *Computer Vision, DeepLabV3+, Real-Time Streaming Protocol, Quality of Service, Virtual Private Server, Wireshark*

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ABSTRACT

IMPLEMENTATION AND PERFORMANCE ANALYSIS OF PDU STONE MONITORING APPLICATION BASED ON COMPUTER VISION AT PT PARAMA DATA UNIT

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Computer vision is a field of artificial intelligence that enables systems to automatically analyze and interpret digital images. This final project implements a drill-cuttings monitoring system on a shale shaker unit using the DeepLabV3+ segmentation model with three backbone variations, namely MobileNetV3, ResNet50, and ResNet101, which are integrated into a desktop application and VPS-based system to support real-time monitoring at PT Parama Data Unit. The testing includes model evaluation, Quality of Service (QoS) analysis on RTSP and VPS communication paths, as well as server performance evaluation during the inference process. The model evaluation results show that ResNet101 achieved the highest mIoU of 87.01%, while MobileNetV3 recorded the fastest inference time of 37.20 ms, or 6.86 times faster than ResNet101 at 255.16 ms. QoS testing on the RTSP path produced throughput values above the minimum camera bitrate required to maintain a 30fps stream. Packet loss on the local network was close to 0%, while the public network reached 22% due to the absence of a retransmission mechanism in UDP transmission. The inter-packet delay across all network scenarios showed very good results within the range of 6–8 ms. QoS testing on the VPS path showed system throughput usage that did not heavily burden network bandwidth, with utilization ranging from 0.3–0.5%. Packet loss remained below 0.5% due to the presence of a retransmission mechanism in TCP communication. Delay results were categorized as very good, remaining below 150 ms. Server performance evaluation showed that MobileNetV3 was the most efficient model with CPU usage of 22.9%, compared to ResNet50 (81.8%) and ResNet101 (93.3%). The system successfully supported stable, efficient, and integrated real-time monitoring.

Keywords: *Computer Vision, DeepLabV3+, Real-Time Streaming Protocol, Quality of Service, Virtual Private Server, Wireshark*