PENGEMBANGAN SISTEM DETEKSI PEMALSUAN QRIS MERCHANT PRESENTED MODE (MPM) STATIS

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ABSTRAK

Transformasi digital telah memposisikan *Quick Response Code Indonesian Standard* (QRIS) sebagai tulang punggung sistem pembayaran nasional, namun popularitas QRIS *Merchant Presented Mode* (MPM) Statis juga memicu ancaman keamanan berupa pemalsuan stiker fisik yang merugikan masyarakat. Penelitian ini mengusulkan solusi inovatif berupa sistem deteksi pemalsuan berlapis yang mengintegrasikan aspek visual, data digital, dan kontekstual lokasi. Dengan mengadopsi metodologi *Software Development Life Cycle* (SDLC) *Waterfall Iterative*, penelitian ini membangun dataset komprehensif sebanyak 898 citra yang mencakup berbagai skenario rekayasa manipulatif seperti penghapusan atribut standar dan *spoofing*. Inti teknologi sistem ini mengandalkan model deteksi objek YOLOv11 untuk memastikan kepatuhan tata letak visual terhadap standar Buletin ASPI No: 3/III/2021, yang dipadukan dengan *engine* PaddleOCR untuk mengekstrak informasi tekstual seperti NMID dan nama *merchant*. Validasi dilakukan melalui mekanisme *Cross-Validation* antara teks pada tampilan fisik dengan *payload* asli di dalam kode QR, serta verifikasi geolokasi menggunakan GPS perangkat. Hasil pengujian menunjukkan bahwa model YOLO11-m mencapai performa deteksi tinggi dengan mAP50-95 sebesar 0,8682, sementara sistem secara keseluruhan (*end-to-end*) mencatatkan tingkat akurasi sebesar 96,15%. Dengan waktu pemrosesan rata-rata 2,38 detik pada infrastruktur berbasis FastAPI, Celery, dan Redis, aplikasi ini terbukti efektif dan responsif dalam memitigasi risiko penipuan QRIS tanpa mengganggu kenyamanan bertransaksi. Keberhasilan ini memberikan kontribusi teoritis dan praktis yang signifikan dalam menjaga integritas serta kepercayaan publik terhadap ekosistem pembayaran digital di Indonesia.

Kata Kunci: QRIS, Pemalsuan, YOLOv11, PaddleOCR, *Computer Vision*, Keamanan Pembayaran

Development of a Fraud Detection System for Static Merchant Presented Mode (MPM) QRIS

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ABSTRACT

Digital transformation has positioned the Quick Response Code Indonesian Standard (QRIS) as the backbone of the national payment system; however, the popularity of Static Merchant Presented Mode (MPM) QRIS has also triggered security threats in the form of physical sticker forgery that harms the public. This research proposes an innovative solution through a multi-layered detection system that integrates visual, digital data, and contextual location aspects. Adopting the Waterfall Iterative Software Development Life Cycle (SDLC) methodology, this study constructed a comprehensive dataset of 898 images covering various manipulative engineering scenarios, such as the removal of standard attributes and spoofing. The core technology of the system relies on the YOLOv11 object detection model to ensure visual layout compliance with the ASPI Bulletin No: 3/III/2021 standard, combined with the PaddleOCR engine to extract textual information such as NMID and merchant names. Validation is performed through a cross-validation mechanism between the text on the physical display and the original payload within the QR code, alongside geolocation verification using device GPS. Test results show that the YOLO11-m model achieved high detection performance with an mAP50-95 of 0.8682, while the overall end-to-end system recorded an accuracy rate of 96.15%. With an average processing time of 2.38 seconds on an infrastructure based on FastAPI, Celery, and Redis, this application has proven to be effective and responsive in mitigating QRIS fraud risks without compromising transaction convenience. This success provides significant theoretical and practical contributions to maintaining integrity and public trust in Indonesia's digital payment ecosystem.

Keywords: QRIS, Fraud, YOLOv11, PaddleOCR, Computer Vision, Payment Security.