PENERAPAN METODE RAD SERTA TEKNOLOGI GEOFENCING DAN FACE RECOGNITION PADA SISTEM PRESENSI STUDI KASUS: SD SARASWATI 4 DENPASAR

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ABSTRAK

Penelitian ini diarahkan untuk membangun dan mengembangkan platform presensi digital Saraspatika berbasis validasi lokasi geofencing dan pengenalan wajah dengan menerapkan pendekatan Rapid Application Development (RAD), serta mengevaluasi keluaran dari proses pengujian pada sistem yang dikembangkan. Metode RAD digunakan melalui proses identifikasi kebutuhan, penyusunan rancangan sistem, dan penerapan fitur secara iteratif agar sistem dapat menyesuaikan dengan kebutuhan pengguna. Sistem dikembangkan menggunakan Flutter pada aplikasi mobile, *Next.js* sebagai *API service*, *Flask* untuk layanan *face recognition*, *PostgreSQL* sebagai basis data, serta *OpenStreetMap* API untuk mendukung validasi lokasi. Fitur yang dikembangkan meliputi kontrol akses berbasis lokasi, pendaftaran dan verifikasi wajah, pengajuan cuti, pengajuan sakit dan izin, pengelolaan jadwal kerja pegawai, agenda mengajar guru, monitoring ketidakhadiran, manajemen pengguna, pelacakan lokasi, serta pengelolaan data wajah. Pengujian dilakukan melalui *white-box testing*, *unit testing*, *load testing*, dan *alpha testing* berbasis *black-box testing*. Temuan pengujian memperlihatkan bahwa logika utama sistem mengikuti jalur independen yang dianalisis. Unit testing pada agregasi absensi, perhitungan total kehadiran, dan validasi radius menghasilkan keluaran sesuai harapan. *Alpha testing* memperoleh validitas 100% dari 33 skenario pengujian, tanpa skenario yang tidak sesuai. *Load testing* menunjukkan bahwa sistem mampu menangani 36 akses serentak pada *endpoint* absensi kedatangan dan kepulangan dengan tingkat kegagalan 0,00%. Rata-rata respons *endpoint* kedatangan sebesar 4539,60 ms dan kepulangan sebesar 954,96 ms. Dengan demikian, Saraspatika dinyatakan valid secara fungsional, stabil secara teknis, dan layak diimplementasikan sebagai sistem presensi digital di SD Saraswati 4 Denpasar. Rekomendasi pengembangan mencakup penambahan fitur deteksi keluar area, optimasi respons server, serta pengujian akurasi *face recognition* pada kondisi pencahayaan dan perangkat yang berbeda secara berkelanjutan. Pengembangan tersebut diharapkan dapat meningkatkan keandalan, akurasi, dan keberlanjutan pemanfaatan sistem dalam mendukung kebutuhan administrasi kehadiran sekolah ke depan.

Kata kunci: presensi digital, *RAD*, *geofencing*, *face recognition*

THE APPLICATION OF THE RAD METHOD AND GEOFENCING AND FACE RECOGNITION TECHNOLOGIES IN AN ATTENDANCE SYSTEM: A CASE STUDY AT SD SARASWATI 4 DENPASAR

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ABSTRACT

This study is directed at designing and developing the Saraspatika digital attendance system based on geofencing and face recognition technologies by applying the Rapid Application Development (RAD) method, as well as to assess the testing results of the developed system. The RAD method was implemented through requirements identification, system planning, and iterative implementation to ensure that the system could be adapted to user needs. The system was built using Flutter for the mobile application, Next.js as an API service, Flask for the face recognition service, PostgreSQL as the database, and the OpenStreetMap API to support location validation. The developed features include location-based access control, face registration and verification, leave requests, sick leave and permission requests, employee work schedule management, teacher teaching agenda management, absence monitoring, user management, location tracking, and facial data management. System testing was carried out through white-box testing, unit testing, load testing, and alpha testing with a black-box testing approach. The testing outcomes show that the main system logic operated according to the analyzed independent paths. Unit testing on attendance aggregation, total attendance calculation, and radius validation produced the expected outputs. Alpha testing achieved 100% validity from 33 test scenarios, with no invalid scenarios identified. Load testing demonstrated that the system could handle 36 concurrent accesses on the check-in and check-out attendance endpoints with a failure rate of 0.00%. The mean response time for the check-in endpoint was 4539.60 ms, while the check-out endpoint recorded 954.96 ms. Therefore, Saraspatika is considered functionally valid, technically stable, and suitable for implementation as a digital attendance system at SD Saraswati 4 Denpasar. Development recommendations include adding a geofence exit detection feature, optimizing server response time, and continuously testing face recognition accuracy under different lighting conditions and devices. These improvements are expected to enhance system reliability, accuracy, and sustainability in supporting future school attendance administration needs.

Keywords: *digital attendance, RAD, geofencing, face recognition.*