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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

INTISARI

Rancang Bangun Sistem Monitoring Kendaraan Berbasis Protokol CAN Bus Menggunakan ESP32 via OBD-II

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Pertumbuhan jumlah kendaraan bermotor di Indonesia yang pesat belum diimbangi sistem pemantauan kondisi kendaraan yang mudah diakses. Pemantauan saat ini masih bergantung pada pemeriksaan berkala di bengkel yang bersifat periodik dan tidak mampu membaca perubahan kondisi secara *real-time*, sementara alat diagnostik komersial umumnya memerlukan perangkat khusus profesional.

Penelitian ini merancang sistem monitoring kendaraan berbasis IoT menggunakan ESP32 yang terhubung langsung ke jaringan CAN Bus kendaraan melalui *transceiver* TJA1050 dan konektor OBD-II. Data dari ECU ditransmisikan menggunakan protokol MQTT dan divisualisasikan secara *real-time* pada *web dashboard* berbasis Next.js, menampilkan parameter RPM, kecepatan, suhu mesin, suhu oli, *throttle position*, level bahan bakar, tegangan baterai, dan odometer mesin. Pengujian dilakukan terhadap pembacaan CAN Bus, kestabilan koneksi MQTT, latensi transmisi data, serta tampilan dan fungsionalitas dashboard.

Hasil pengujian menunjukkan seluruh delapan parameter berhasil dibaca tanpa kegagalan, koneksi MQTT stabil dengan *reconnect* kurang dari sepuluh detik, dan latensi transmisi data rata-rata di bawah 1 detik. *Dashboard* mampu menampilkan seluruh data secara *real-time* melalui *gauge*, *indicator card*, *bar gauge*, dan grafik historis, sehingga sistem terbukti mendukung tujuan penelitian dalam menghadirkan monitoring kendaraan yang efisien, fleksibel, dan intuitif.

Kata Kunci: *Internet of Things*, OBD-II, ESP32, CAN Bus, MQTT, Monitoring Kendaraan

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ABSTRACT

Design and Development of a Vehicle Monitoring System Based on CAN Bus Protocol Using ESP32 via OBD-II

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The rapid growth of motor vehicle ownership in Indonesia has not been matched by an easily accessible vehicle condition monitoring system. Current monitoring still relies on periodic workshop inspections, which cannot capture changes in vehicle condition in real time, while commercial diagnostic tools generally require specialized professional equipment.

This study develops an IoT-based vehicle monitoring system using an ESP32 connected directly to the vehicle's CAN Bus network through a TJA1050 transceiver and an OBD-II connector. Data from the ECU is transmitted using the MQTT protocol and visualized in real time on a Next.js based web dashboard, displaying parameters such as RPM, speed, coolant temperature, oil temperature, throttle position, fuel level, battery voltage, and engine odometer. Testing was carried out on CAN Bus data reading, MQTT connection stability, data transmission latency, and dashboard display and functionality.

Testing results show that all eight parameters were successfully read without failure, the MQTT connection remained stable with a reconnect time of under ten seconds, and the average data transmission latency was below 1 second. The dashboard was able to display all data in real time through gauges, indicator cards, bar gauges, and historical charts, demonstrating that the system successfully supports the research objective of delivering an efficient, flexible, and intuitive vehicle monitoring solution.

Keywords: Internet of Things, OBD-II, ESP32, CAN Bus, MQTT, Vehicle Monitoring.