

ABSTRAK

RANCANG BANGUN ALAT PEMADAM KEBAKARAN BERBASIS IOT DENGAN MENGGUNAKAN MIKROKONTROLER ESP32

(Liani Siti Anggraeni: 2026; 110 halaman)

Kebakaran merupakan bencana yang dapat menimbulkan kerugian material dan mengancam keselamatan jiwa sehingga diperlukan sistem deteksi dan penanganan yang cepat. Penelitian ini merancang alat pemadam kebakaran portabel berbasis Internet of Things (IoT) menggunakan ESP32 yang mengintegrasikan flame sensor 5 channel, sensor suhu XY-MD04, sensor asap ZH03B, sensor gas MiCS5524, pressure sensor, serta APAR sebagai media pemadam. Sistem mampu mendeteksi potensi kebakaran, mengaktifkan alarm, membuka motorized ball valve untuk proses pemadaman otomatis maupun manual, serta menampilkan kondisi alat melalui LCD dan ESP32 web server yang dapat diakses melalui smartphone. Hasil perancangan menunjukkan bahwa integrasi multi-sensor mampu meningkatkan akurasi deteksi sehingga diharapkan menjadi solusi deteksi dini dan penanganan kebakaran tahap awal yang efektif dan mudah diterapkan.

Kata Kunci: Pemadam Kebakaran, IoT, ESP32, Flame Sensor, Sensor Suhu XY-MD04, Sensor Asap ZH03B, Sensor Gas MiCS5524, APAR, Web Server.

ABSTRACT

DESIGN AND DEVELOPMENT OF AN IoT-BASED FIRE EXTINGUISHING SYSTEM USING ESP32 MICROCONTROLLER

(Liani Siti Anggraeni: 2026; 110 pages)

Fire is one of the most common disasters that can cause significant property damage and threaten human safety, making early detection and rapid response essential. This study presents the design and implementation of a portable Internet of Things (IoT)-based fire suppression system using an ESP32 microcontroller as the main controller. The system integrates a 5-channel flame sensor, an XY-MD04 temperature sensor, a ZH03B smoke sensor, a MiCS5524 gas and carbon monoxide (CO) sensor, a pressure sensor, and a dry chemical powder fire extinguisher (APAR) as the extinguishing medium. The system is capable of detecting potential fire hazards, activating an alarm, automatically or manually controlling a motorized ball valve to discharge the extinguishing agent, and displaying system status through an LCD and an ESP32 web server accessible via a smartphone. The proposed multi-sensor approach improves fire detection accuracy and enables effective early-stage fire suppression. Therefore, the developed system is expected to provide an effective, portable, and practical solution for early fire detection and initial fire response.

Keywords: Fire Suppression System, Internet of Things (IoT), ESP32, Flame Sensor, XY-MD04 Temperature Sensor, ZH03B Smoke Sensor, MiCS5524 Gas Sensor, Fire Extinguisher (APAR), Web Server.