INTISARI

Perkembangan teknologi telah memudahkan pengawasan dan pencegahan kondisi ruangan, termasuk kebakaran, melalui *smartphone*. Dengan sistem berbasis IoT (*Internet of Things*), operator dapat memantau dan mengendalikan perangkat keamanan dari jarak jauh, yang sangat penting dalam mencegah insiden seperti kebakaran. Ancaman kebakaran pada bangunan rumah, gedung, dan tempat umum lainnya menjadi perhatian utama dalam perancangan sistem keamanan. Berdasarkan peraturan Kementerian PUPR Nomor 20/PRT/M/2019, proteksi kebakaran pada bangunan wajib diperhatikan, termasuk penyediaan alat dan sistem yang efektif untuk mencegah kebakaran.

Sistem pencegahan kebakaran berbasis IoT ini menggunakan mikrokontroler ESP32 sebagai pusat kendali yang mengintegrasikan berbagai sensor, seperti sensor gas MQ-7, sensor DHT22, serta sensor KY-026. Ketika suhu ruangan melebihi 27°C, sistem akan mengaktifkan *exhaust fan* untuk menjaga suhu tetap stabil. Selain itu, dua sensor api harus aktif bersamaan untuk mendeteksi kebakaran besar, yang akan memicu pompa air dan *buzzer* sebagai tindakan respon. Sensor asap bekerja jika kadar asap melebihi 50ppm, memicu *exhaust fan* untuk mengeluarkan asap dari ruangan. Jika asap terdeteksi di bawah 50ppm, sistem tidak akan mengaktifkan *output* apa pun.

Sistem pencegahan kebakaran berbasis IoT ini telah berhasil mendeteksi kondisi tidak normal dalam ruangan seperti peningkatan suhu, sensor gas berhasil mendeteksi konsentrasi gas yang beragam pada berbagai kondisi dan deteksi adanya api dengan tingkat keberhasilan 75%. Sistem ini juga mengirimkan notifikasi secara *real-time* melalui aplikasi Telegram dan mencatat data ke *Google Spreadsheet*. Perbedaan ketinggian peletakan sensor suhu terbukti bahwa titik suhu pada setiap sudut ruangan berbeda, dan sensor api KY-026 efektif mendeteksi api dalam jarak 45-55 cm. Namun, sensor ini menunjukkan kesalahan pembacaan di siang hari.

Kata Kunci : Pencegahan Kebakaran, IoT, *Spreadsheet*, Telegram, *Buzzer*

ABSTRACT

Technological developments have made it easier to monitor and prevent room conditions, including fires, via smartphones. With an IoT (Internet of Things)-based system, operators can monitor and control security devices remotely, which is very important in preventing incidents such as fires. The threat of fire in houses, buildings, and other public places is a major concern in designing security systems. Based on the regulation of the Ministry of PUPR Number 20/PRT/M/2019, fire protection in buildings must be considered, including the provision of effective tools and systems to prevent fires.

This IoT-based fire prevention system uses an ESP32 microcontroller as a control center that integrates various sensors, such as the MQ-7 gas sensor, DHT22 sensor, and KY-026 sensor. When the room temperature exceeds 27°C, the system will activate the exhaust *fan* to keep the temperature stable. In addition, two fire sensors must be active simultaneously to detect major fires, which will trigger the water pump and buzzer as a response. The smoke sensor works if the smoke level exceeds 50ppm, triggering the exhaust *fan* to remove smoke from the room. If smoke is detected below 50ppm, the system will not activate any output.

This IoT-based fire prevention system has successfully detected abnormal conditions in the room such as increased temperature, the gas sensor successfully detected varying gas concentrations in various conditions and detected fire with a success rate of 75%. This system also sends real-time notifications via the Telegram application and records data to Google Spreadsheet. The difference in the height of the temperature sensor placement proves that the temperature points in each corner of the room are different, and the KY-026 fire sensor is effective in detecting fire within a distance of 45-55 cm. However, this sensor shows reading errors during the day.

Keywords: Fire Prevention, IoT, Spreadsheet, Telegram, Buzzer