

ABSTRAK

RANCANG BANGUN SISTEM PERINGATAN PERANGKAP HAMA TIKUS BERBASIS IOT UNTUK UMKM

(Muhammad Adi Wijaya 2026:44)

Penelitian ini bertujuan merancang dan membangun sistem peringatan perangkap hama tikus berbasis *Internet of Things* (IoT) untuk membantu monitoring perangkap secara jarak jauh pada lingkungan UMKM. Sistem menggunakan mikrokontroler ESP32 sebagai pengendali utama yang terintegrasi dengan sensor ultrasonik HC-SR04, sensor infrared FC-51, sensor getar SW420, motor servo, modul ESP32-CAM, LED, dan Telegram Bot. Sensor HC-SR04 digunakan untuk mendeteksi keberadaan tikus pada area perangkap dan mengaktifkan motor servo untuk menutup pintu perangkap secara otomatis. Setelah perangkap tertutup, sensor infrared FC-51 dan sensor getar SW420 melakukan pemantauan kondisi bilik, sedangkan ESP32-CAM mengambil dan mengirimkan gambar kondisi perangkap melalui Telegram. Sistem juga dilengkapi fitur multi-bilik, status bilik yang terdiri dari BELUM DIPASANG, SIAP, dan TERTUTUP, serta Mode Passive untuk mendukung proses pemasangan dan perawatan perangkap. Hasil pengujian menunjukkan bahwa sensor HC-SR04 mampu mendeteksi objek pada jarak kurang lebih 18 cm dengan rata-rata waktu deteksi sekitar 2 detik, motor servo mampu menutup perangkap dengan rata-rata waktu respon 0,5 detik, sensor infrared FC-51 memiliki rata-rata waktu deteksi 4–6 detik, sensor getar SW420 memiliki rata-rata waktu deteksi 5–7 detik dengan jeda notifikasi selama 10 detik, serta ESP32-CAM mampu mengambil dan mengirimkan gambar melalui Telegram dengan rata-rata waktu respon 6–9 detik. Berdasarkan hasil pengujian tersebut, sistem mampu menjalankan fungsi deteksi, penutupan perangkap, monitoring kondisi bilik, serta pengiriman notifikasi dan gambar secara *Real-Time* melalui Telegram sehingga dapat digunakan sebagai solusi monitoring perangkap tikus jarak jauh pada lingkungan UMKM.

Kata Kunci: *Internet of Things* (IoT), perangkap hama tikus, ESP32, ESP32-CAM, Telegram Bot, monitoring jarak jauh.

ABSTRACT

DESIGN AND DEVELOPMENT OF AN IOT-BASED RAT PEST TRAP WARNING SYSTEM FOR MSMEs

(Muhammad Adi Wijaya 2026:44)

This study aims to design and develop an Internet of Things (IoT)-based rat pest trap warning system to support remote monitoring of rat traps in Micro, Small, and Medium Enterprises (MSMEs). The system uses an ESP32 microcontroller as the main controller integrated with an HC-SR04 ultrasonic sensor, FC-51 infrared sensor, SW420 vibration sensor, servo motor, ESP32-CAM module, LED, and Telegram Bot. The HC-SR04 ultrasonic sensor is used to detect the presence of rats in the trap area and activate the servo motor to close the trap door automatically. After the trap is closed, the FC-51 infrared sensor and SW420 vibration sensor monitor the condition of the trap chamber, while the ESP32-CAM captures and sends images of the trap condition through Telegram. The system is also equipped with a multi-chamber feature, chamber status indicators consisting of NOT INSTALLED, READY, and CLOSED, and a Passive Mode to support trap setup and maintenance activities. The test results show that the HC-SR04 sensor is capable of detecting objects at a distance of approximately 18 cm with an average detection time of about 2 seconds. The servo motor closes the trap with an average response time of 0.5 seconds, the FC-51 infrared sensor has an average detection time of 4–6 seconds, and the SW420 vibration sensor has an average detection time of 5–7 seconds with a 10-second notification interval. In addition, the ESP32-CAM successfully captures and sends images through Telegram with an average response time of 6–9 seconds. Based on the test results, the system is capable of performing object detection, automatic trap closing, chamber condition monitoring, and Real-Time notification and image transmission through Telegram. Therefore, the developed system can be utilized as a remote rat trap monitoring solution for MSME environments.

Keywords: Internet of Things (IoT), rat pest trap, ESP32, ESP32-CAM, Telegram Bot, remote monitoring.