

## ABSTRAK

### RANCANG BANGUN SISTEM DETEKSI BINATANG PENYEBAB GANGGUAN DISTRIBUSI LISTRIK JARINGAN SUTM BERBASIS INTERNET OF THINGS (IoT)

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Penyaluran listrik tegangan menengah di Indonesia didominasi menggunakan saluran udara tegangan menengah (SUTM). SUTM adalah konstruksi penyaluran tenaga listrik tanpa isolasi dengan tegangan berkisar 5kV hingga 20kV yang menghubungkan gardu induk dengan pelanggan. SUTM sering mengalami gangguan sesaat hingga permanen akibat faktor binatang seperti kukang dan tupai. Penelitian ini bertujuan merancang sistem deteksi binatang berbasis IoT yang dapat mencegah dan memberi peringatan berupa gambar jika terdapat binatang atau suhu yang berlebih pada jaringan SUTM. Sistem deteksi ini menggunakan sensor PIR HC-SR501 untuk mendeteksi gerakan binatang, sensor DHT22 untuk mendeteksi suhu, *buzzer* ultrasonik untuk mencegah binatang, dan ESP32-CAM untuk mengambil gambar. Data dari sensor dikirim ke platform IoT Thingsboard menggunakan mikrokontroler NodeMCU ESP32, serta gambar dikirim ke aplikasi Telegram. Pengujian dilakukan secara subsistem dan keseluruhan dengan simulasi dan pengujian langsung di gardu hubung SUTM. Hasil pengujian menunjukkan bahwa sistem deteksi binatang dapat mendeteksi gerakan binatang dengan sudut deteksi hingga  $\angle 63,4^\circ$  dan sensor DHT22 dapat memantau suhu dengan nilai akurasi suhu 98,78%. *Buzzer* ultrasonik dapat mengusir binatang dengan frekuensi 35kHz. *Delay* pengambilan gambar ESP32-CAM ketika variabel terpenuhi bervariasi tergantung pada provider yang digunakan, dengan Telkomsel memiliki rata-rata *delay* terkecil sebesar 1,39 detik, provider Axis rata-rata *delay* sebesar 1,89 detik dan provider Tri memiliki rata-rata *delay* sebesar 2,34 detik.

**Kata kunci:** NodeMCU ESP32, PIR HC-SR501, DHT22, SUTM, Thingsboard.

## ***ABSTRACT***

### **DESIGN AND IMPLEMENTATION OF AN ANIMAL DETECTION SYSTEM CAUSING DISRUPTION IN THE MEDIUM VOLTAGE ELECTRICITY DISTRIBUTION NETWORK BASED ON INTERNET OF THINGS (IoT)**

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*The distribution of medium voltage electricity in Indonesia is predominantly carried out through Medium Voltage Overhead Lines (SUTM). SUTM is a power distribution construction without insulation, with voltages ranging from 5kV to 20kV, connecting substations to customers. SUTM often encounters disturbances, ranging from momentary interruptions to permanent damage, due to factors such as animals, including civets and squirrels. This research aims to design an IoT-based animal detection system that can prevent and provide warnings, in the form of images, in the event of animals or excessive temperatures on the SUTM network. The detection system utilizes a PIR HC-SR501 sensor for animal movement detection, a DHT22 sensor for temperature monitoring, an ultrasonic buzzer for animal deterrent, and an ESP32-CAM for image capture. Sensor data is transmitted to the Thingsboard IoT platform using the NodeMCU ESP32 microcontroller, while images are sent to the Telegram application. Testing was conducted for subsystems and the entire system, involving simulations and direct testing at the SUTM substation. Test results indicate that the animal detection system can detect animal movements with a detection angle up to  $\angle 63.4^\circ$ , and the DHT22 sensor can monitor temperature with an accuracy of 98.78%. The ultrasonic buzzer effectively deters animals with a frequency of 35kHz. The delay in capturing images by the ESP32-CAM, when specified conditions are met, varies depending on the service provider. Telkomsel exhibited the shortest average delay at 1.39 seconds, Axis had an average delay of 1.89 seconds, and Tri had an average delay of 2.34 seconds.*

**Keywords:** NodeMCU ESP32, PIR HC-SR501, DHT22, SUTM, Thingsboard.