

Inspection power line by using UAVs

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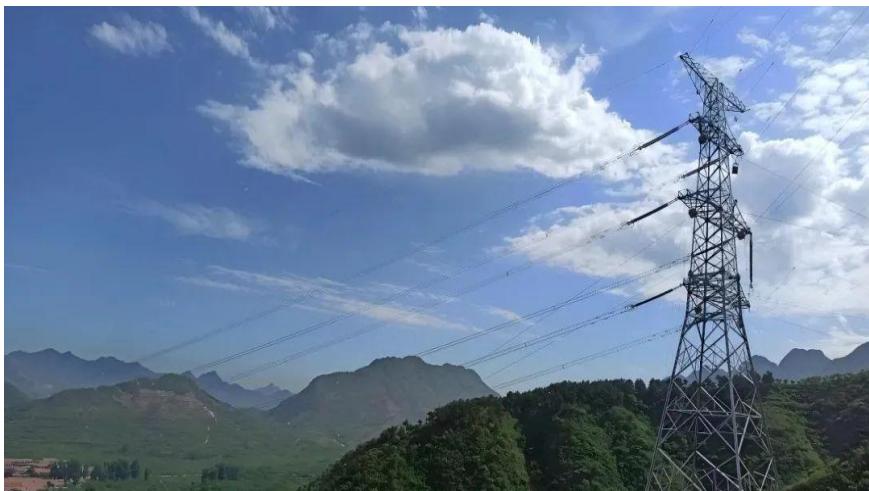
Background

- Electricity Demand Increase
- Electricity Car
- Electricity Bicycle



Motivation

- For Safety
- For Economic Efficiency



Comparison

UAVs are the **most balanced** option, as they are the only method that performs **best in 5 categories** among all the compared approaches.

Table 1
Comparison of different image acquisition techniques.

Platform	Cost	Tracking ^a	Accuracy	Efficiency	Coverage	Safety	Usage
UAV	Low	Difficult	Good	Fast	Good	Safe	5
Land vehicles	Low	Easy	Good	Slow	Limited	Safe	4
Aerial vehicles	High	Easy	Bad	Fast	Good	Unsafe	3
Fixed camera	High	Easy	Good	NA	Limited	Safe	3
Satellite	High	Difficult	Bad	Slow	Good	NA	1
Inspection robots	High	Easy	Good	Slow	Limited	Safe	3

^a Tracking refers to following and keeping track of the power line.

That's why I choose UAVs not other methods!!!

Detection of Power Lines

blend into the background.

Detection of Power Towers

different in shape

Detection of Power Components

Small defects are hard to detect

Detection of Defects

Small defects are hard to detect



Gap of Defect Detection

› **RGB-only dependency & Surface-only detection**

- implies hidden defects may be missed
- most methods ignore internal or subtle faults

› **Rare defect types**

- performance drops on uncommon defect types

› Research Question

- “how to **develop** a robust, generalizable, and efficient **UAV-based insulator defect detection framework** that can reliably **identify** both **common** and **rare defects** under diverse operational and environmental conditions, while supporting real-time deployment and multi-sensor data fusion.”
- **Enhance existing datasets**
 - Merge existing datasets
- **Develop a more robust model**
 - Explore new YOLO variants with attention module

Research Method

Stage	Duration	Timeline	Key Focus
Stage 1: Dataset Preparation and Enhancement	4 weeks	Dec 2025 – Jan 2026	Dataset collection, enhancement, augmentation, rare defect balancing
Stage 2: Model Development and Optimization	8 weeks	Feb – Mar 2026	YOLO variant design, attention integration, ablation and tuning
Stage 3: Multi-Sensor Integration & Edge–Cloud Deployment	4 weeks	Apr 2026	Integrate multiple sensor data (e.g., infrared, LiDAR) with RGB images; test with GPU.
Stage 4: Evaluation and Validation	4 weeks	May 2026 (Weeks 17–20)	Model robustness testing, efficiency evaluation, field validation
Stage 5: Report Writing and Submission	2 weeks	Late May 2026	Report compilation, proofreading, and final submission

References

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THANK YOU
