SMART INDIA HACKATHON 2025

TITLE PAGE

- **Problem Statement ID –77**
- **Problem Statement Title- Detection of Unauthorized electric fences in Kerala**
- **Theme- (Smart Automation)**
- **PS Category- Hardware**
- **Team ID-**
- **Team Name: NanoNexus**

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IDEA TITLE

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Smart Guard combines a **core Minimum Viable Product (MVP)** with a **future drone-based vision** to deliver an automated, scalable, and sustainable solution:

MVP (Core) : Ground-based sensor units detect high-voltage fences (>24V), log GPS coordinates, and cut power via relays, with a LoRa-based hub sending real-time SMS alerts to forest officials.

Drone Vision (Future) : A single drone with thermal and EMF sensors enhances wide-area detection, using basic AI to predict HWC hotspots and propose virtual fencing (e.g., GPS collars) as an eco-friendly alternative.

WHY HYBRID : The MVP ensures immediate feasibility for a student team within SIH's 3-4 month timeline, while the drone vision adds cutting-edge innovation, aligning with "Smart Automation"

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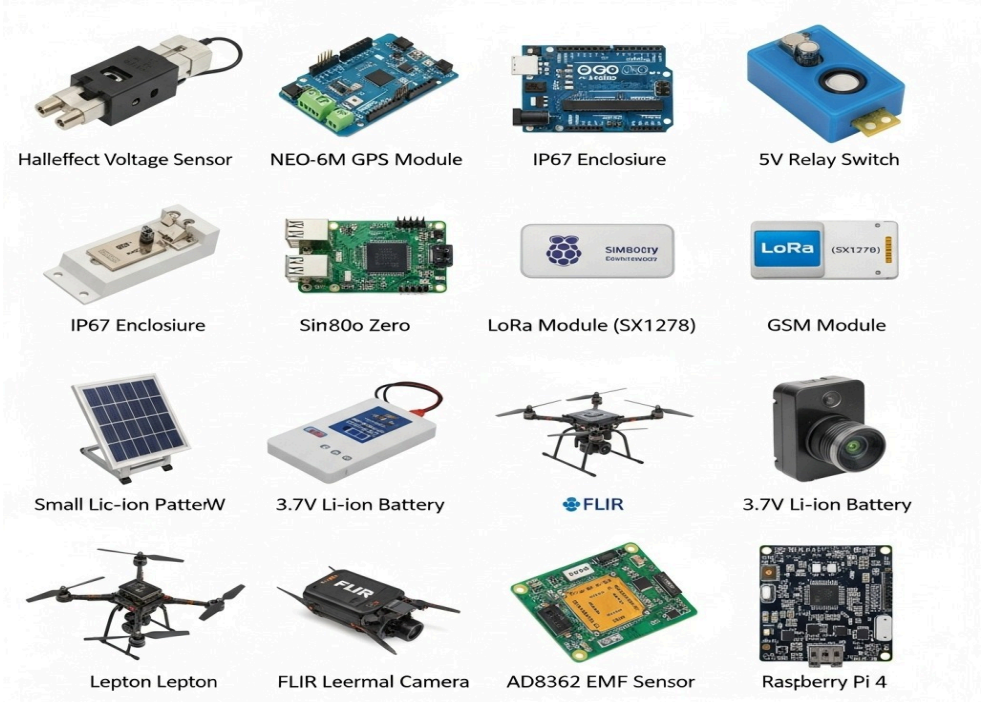
TECHNICAL APPROACH



Hardware Component	Purpose	Estimated Cost (₹)	Phase
Hall-effect Voltage Sensor	Detects high voltage (>24V) in fences to identify unauthorized setups.	1,000 per unit	MVP (Core)
NEO-6M GPS Module	Logs location of detected fences for comparison with approved zones.	1,500 per unit	MVP (Core)
Arduino Uno	Processes sensor data (voltage, GPS) and controls relay for power cutoff.	800 per unit	MVP (Core)
Relay Switch (5V)	Cuts power to unauthorized fences upon detection.	200 per unit	MVP (Core)
IP67 Enclosure	Protects sensor unit from rural/monsoon conditions (dust, water).	500 per unit	MVP (Core)
Raspberry Pi Zero	Central hub for aggregating data from multiple units and hosting logic.	2,000 (one per hub)	MVP (Core)
LoRa Module (SX1278)	Enables long-range (5–10 km), low-power communication between units and hub.	1,000 per unit	MVP (Core)
SIM800L GSM Module	Sends SMS alerts to forest officials for unauthorized fence detection.	1,200 (one per hub)	MVP (Core)
Solar Panel (10W)	Powers sensor units and hub for sustainability in rural areas.	1,500 per unit	MVP (Core)
Battery (3.7V Li-ion)	Stores solar energy for continuous operation (night/monsoons).	1,000 (one per hub)	MVP (Core)
Basic Drone (e.g., DIY Quadcopter)	Equipped with thermal camera and EMF sensor for wide-area detection in future phase.	30,000 per unit	Future (Drone Vision)
Thermal Camera Module (FLIR Lepton)	Detects fence heat signatures or wildfire proximity for enhanced detection.	15,000 per unit	Future (Drone Vision)
EMF Sensor (AD8362)	Detects electromagnetic fields from high-voltage fences during drone patrols.	2,000 per unit	Future (Drone Vision)
Raspberry Pi 4 (for Drone)	Processes drone sensor data and runs basic AI (rule-based or TinyML) for detection analytics.	4,000 per unit	Future (Drone Vision)

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Methodology Workflow Description

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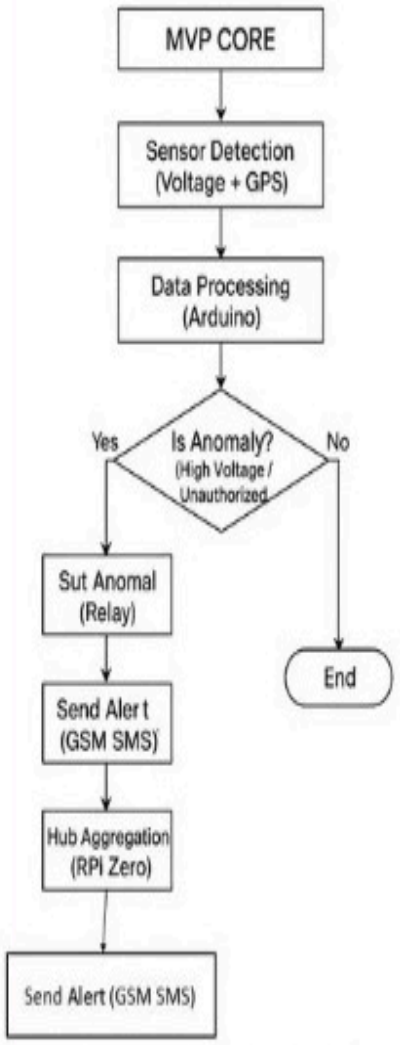

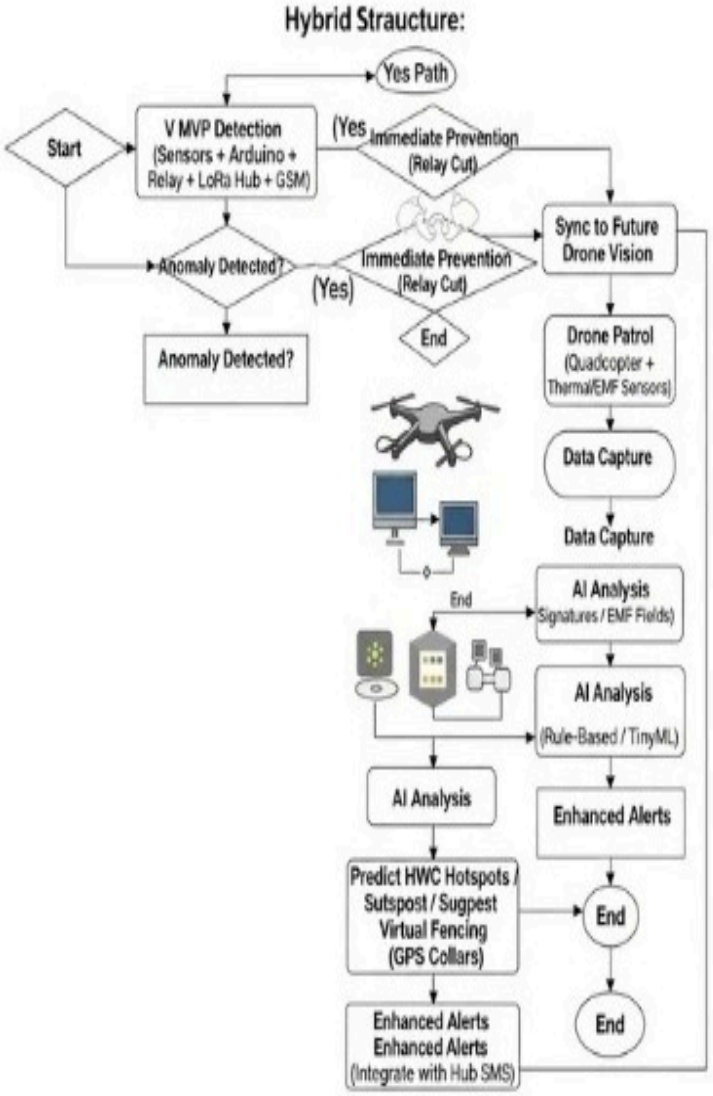

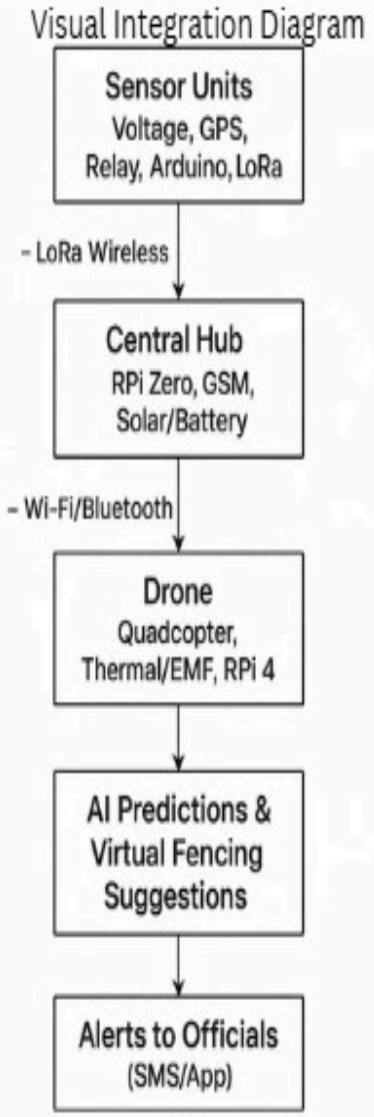

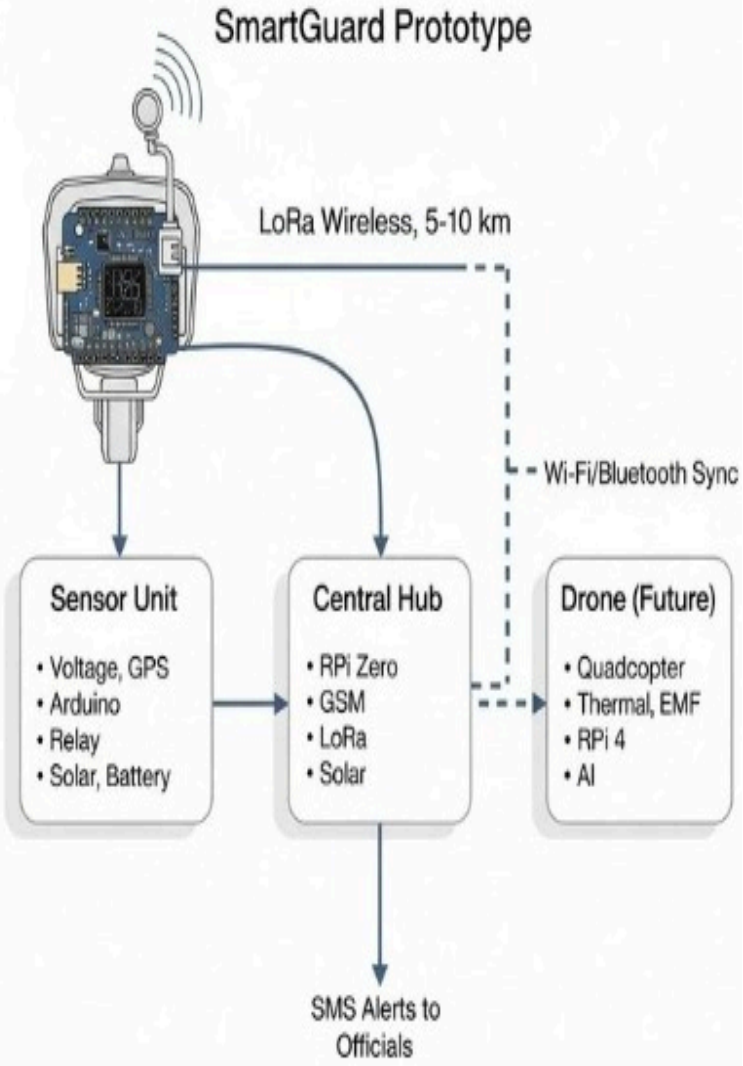

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FEASIBILITY AND VIABILITY

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- Team skills: excel in Arduino, circuits, and coding for MVP sensor units, skilled in IoT, python, and basic AI for hub and drone planning
- Two SIH mentors guide LoRa, GSM, and drone SDK integration. Proven by 2024 SIH winners for similar IoT projects
- Hardware Accessibility and cost: MVP: 31,500 drone vision: 51K, fits SIH funding (1-3lakhs)
- Testing & Risk mitigation: mvp tested in campus simulation (30v wires, <5s response). Focus on beginner-friendly MVP ensures delivery;drone as future phases.

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IMPACT AND BENEFITS

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- **Quantifiable Goals**: Targets 30-50% reduction in wildlife deaths (e.g., 223 animals 2017-2022) and human fatalities (~24/year).
- **Regulatory Compliance**: Enforces Kerala's low-voltage solar fence rules, reducing illegal grid connections.
- **Societal Benefit**: Mitigates HWC, protects biodiversity, and supports farmers with sustainable alternatives (e.g., virtual fencing).
- **Scalability**: MVP covers local areas; drones extend to regional monitoring, ideal for Kerala's forest-farmland zones.

Your Team Name

RESEARCH AND REFERENCES

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