SMART INDIA HACKATHON 2025

Smart AI Drone for Leaf-Level Precision Spraying

- **Problem Statement ID -** 25015
- **Problem Statement Title -**
  Intelligent Pesticide Sprinkling System Determined by the Infection Level of a Plant
- **Theme -** Agriculture, Food Tech & Rural Development
- **PS Category -** Hardware
- **Team Name -** STARK

Team STARK

Smart AI Drone for Leaf-Level Precision Spraying

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~ Proposed Solution

A modular drone system that captures leaf images, runs AI-based infection detection at a central hub, and sends precise spray commands to the drone's 1-axis spray arm — spraying only infected plants, not entire fields.

~ Explanation

- *Capturing crop images through camera (esp32cam) mounted on a drone.*
- *Analyzing plant health at a central hub set up using AI models to detect infections.*
- *Sending precise commands back to the drone to spray only the infected areas using a controlled 1-axis spray arm.*
- *Providing a farmer-friendly dashboard to monitor crop health, pesticide levels, battery status, and overall coverage in real time*

~ How it addresses the problem

Reduce Pesticide Usage

Cuts costs,improving crop yield and quality.

Protects the environment by minimizing chemical overuse.

~ Innovation & Uniqueness

Leaf-level precision spraying

Integration of AI + IoT + Drones

Dynamic infection-based spraying

TECHNICAL APPROACH

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Technologies

Hardware

1-axis spray and esp32cam arm.
ESP32-CAM for image capture
Raspberry Pi 5 for on-site processing

Software & AI

Image Processing: OpenCV and a lightweight model [or direct GPT API on esp (easy approach)] for infection and data

A web-based dashboard for real-time monitoring, live mapping, and emergency controls.

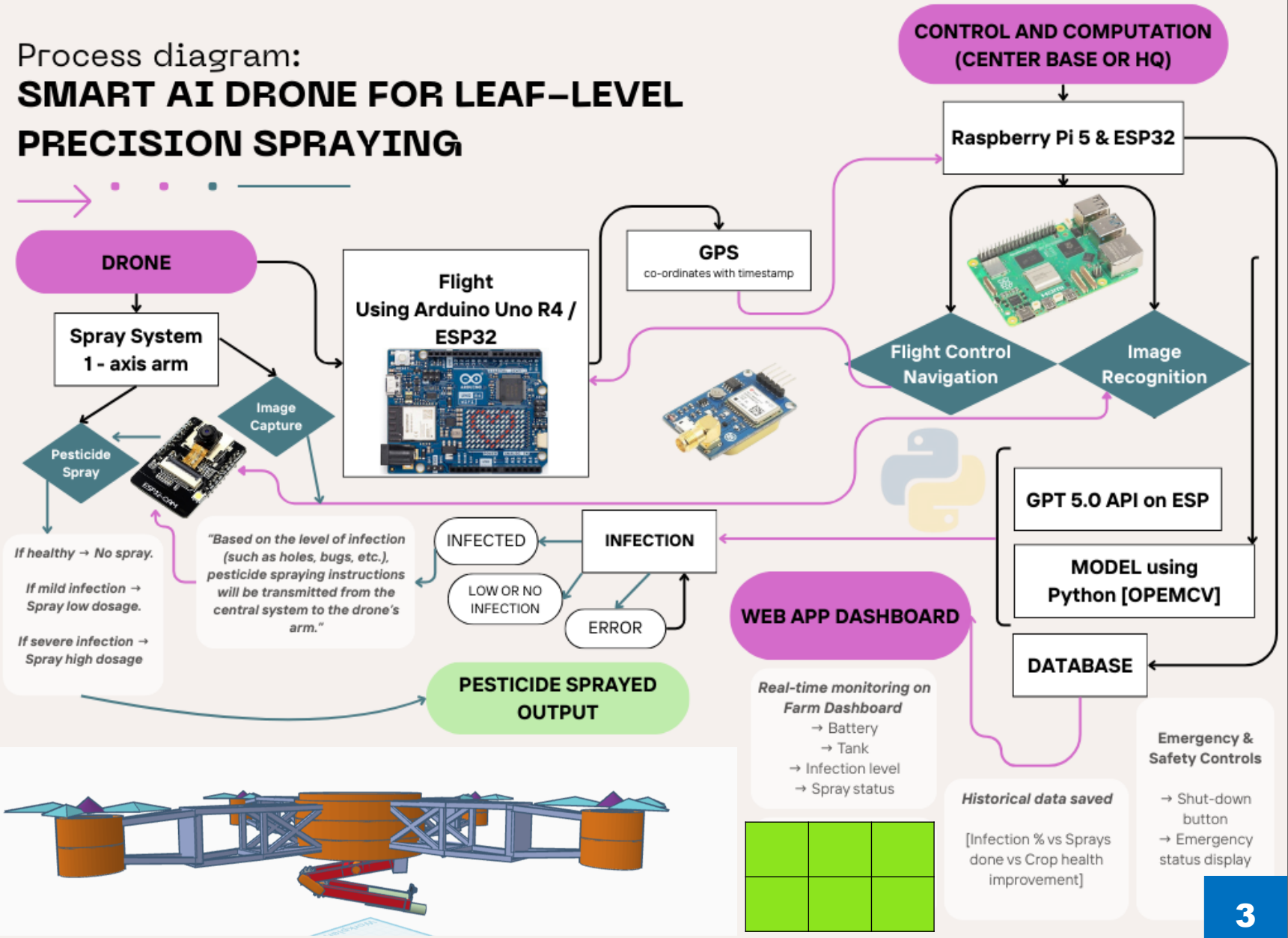
Process Flow

The system follows a continuous loop of

Capture → Analyze →Decide → Command → Execute → Log.

Process diagram:

SMART AI DRONE FOR LEAF–LEVEL PRECISION SPRAYING



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FEASIBILITY AND VIABILITY

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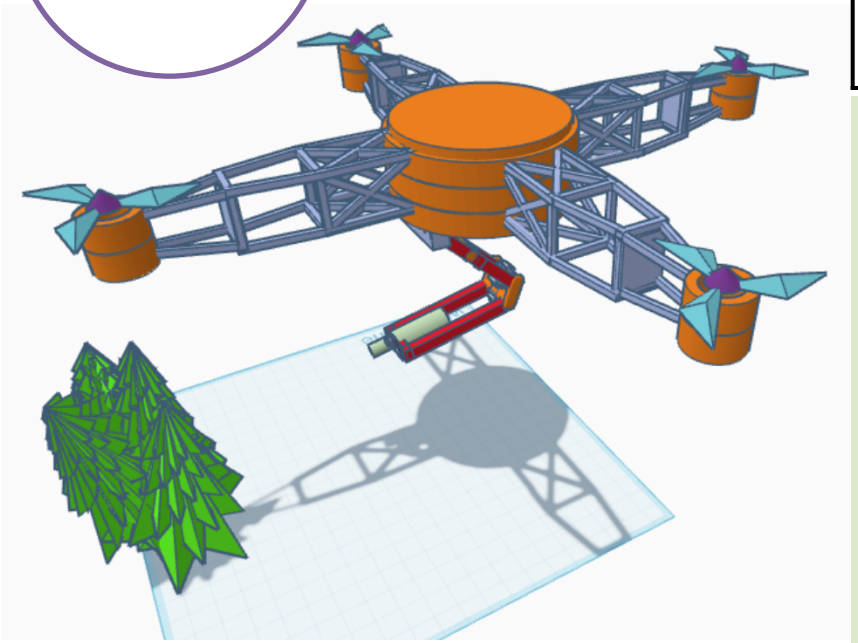
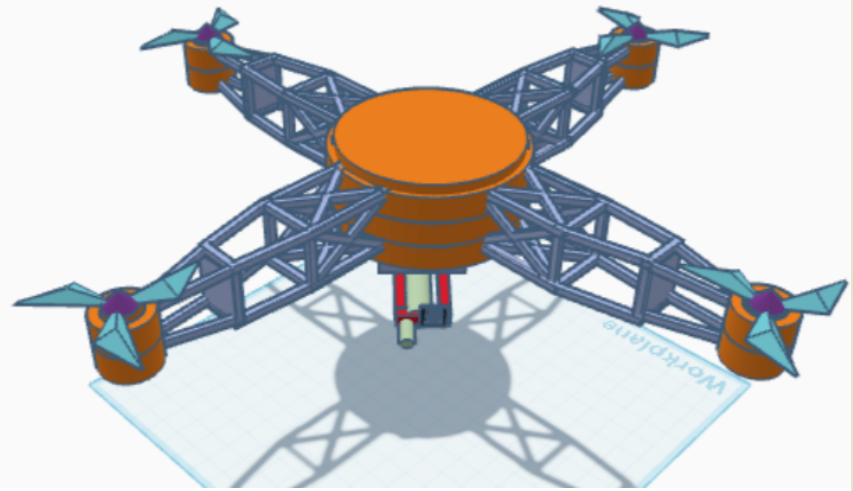
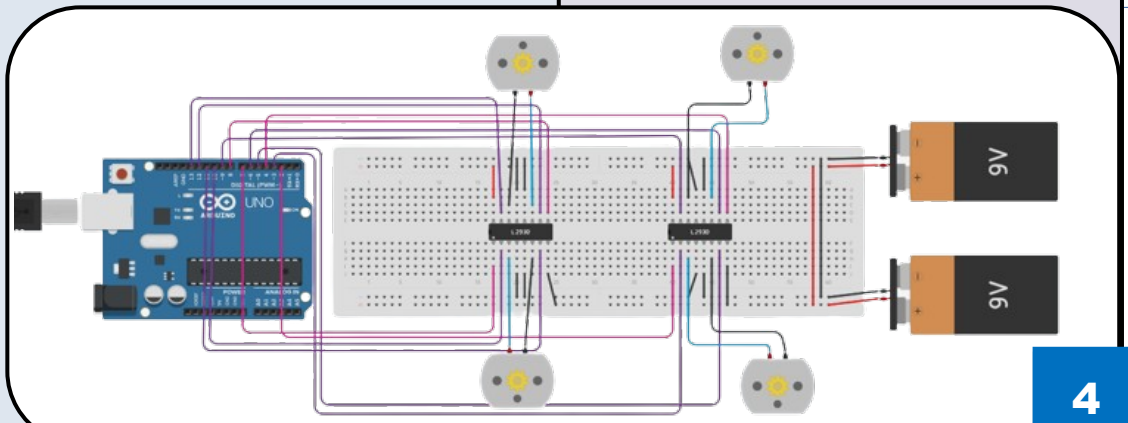




Feasibility ✅	Challenges ⚠	Solutions 💡
Prototype →3D CAD model, Circuit schematics, Tinkercad Arduino simulation test	AI Detection Accuracy across varying light / crop conditions	Region-specific dataset training (Open CV + ML)
Scalable & Modular Design → Swappable batteries, cartridge spray tanks	Limited Flight Time & Payload (20–30 min flight, small tank)	Quick Battery Swap + Modular Cartridge Refill
Technologies ESP32, Raspberry Pi, GPS, Open CV, Python ML	Connectivity Issues in remote farms	Edge AI on Raspberry Pi → Works offline
Farmer-Friendly Ops → Mobile/Web Dashboard (low training need)		



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IMPACT AND BENEFITS

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🚀 Potential Impact

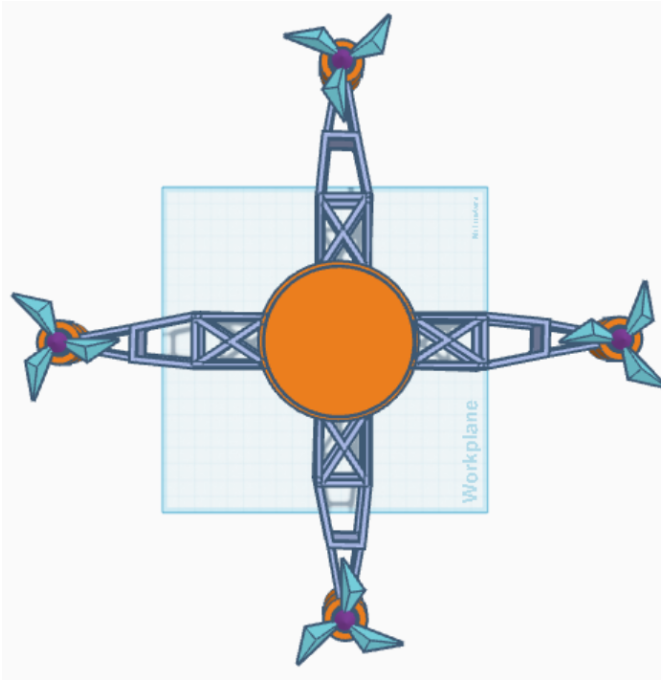
- Our solution directly addresses the core problem of indiscriminate pesticide use.
- **Reduces Farmer Costs:** Drastically cuts down pesticide expenses by up to 50% through targeted spraying.
- **Saves Labor & Time:** Automates the manual, labor-intensive process of inspecting and spraying fields.
- **Boosts Crop Yield:** Ensures timely and precise treatment of infected plants, leading to healthier crops and better harvests.

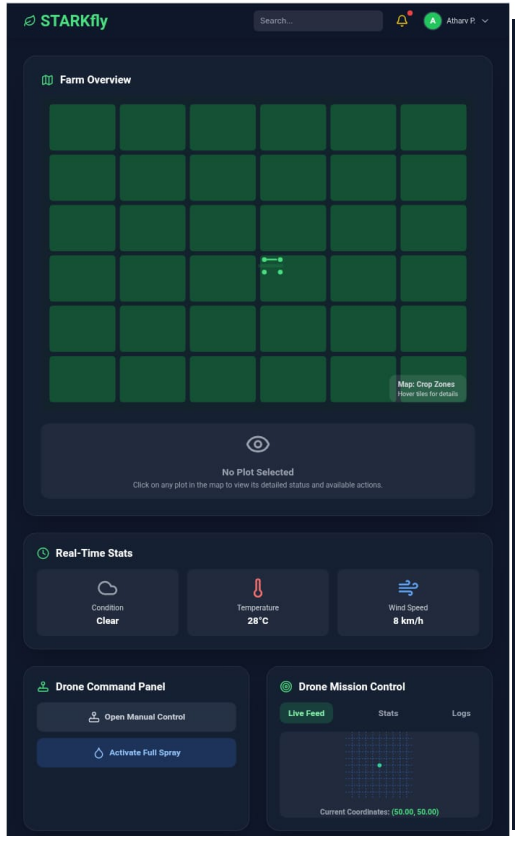
🎯 Key Benefits

Economic: Increases profit margins and supports the financial sustainability of small and marginal farmers.

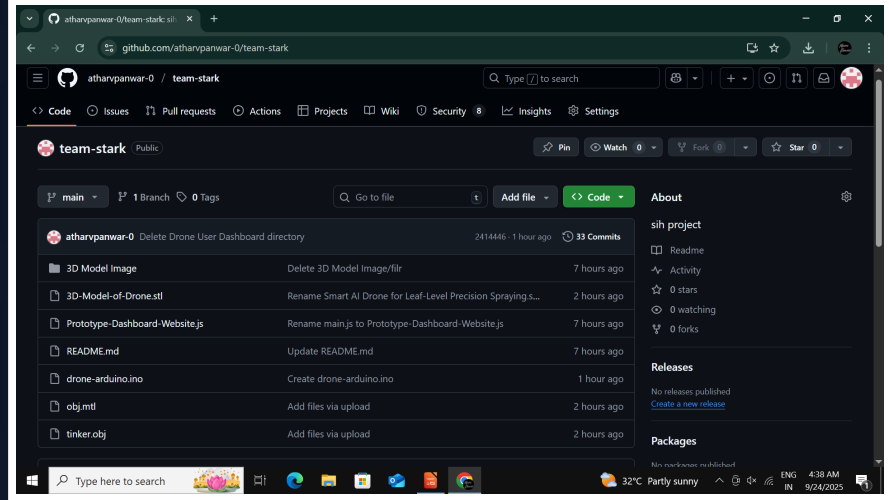
Environmental: Protects soil and water from chemical contamination and safeguards beneficial organisms like pollinators.

Social: Contributes to a safer food supply by reducing pesticide residue, benefiting both farmers and consumers.


Workplane


STARKfly
Search...
Atharv P.
Farm Overview
Map: Crop Zones
Hover tiles for details
No Plot Selected
Click on any plot in the map to view its detailed status and available actions.
Real-Time Stats
Condition
Clear
Temperature
28°C
Wind Speed
8 km/h
Drone Command Panel
Open Manual Control
Activate Full Spray
Drone Mission Control
Live Feed
Stats
Logs
Current Coordinates: (50.00, 50.00)


Drone Command Panel
Open Manual Control
Activate Full Spray
Drone Mission Control
Live Feed
Stats
Logs
Current Coordinates: (50.00, 50.00)
Farm Sensor Readings
Moisture
42%
Normal
Temperature
32°C
Humidity
58%
Light
8.5 klx
System Status
85%
65%
Drone Battery: 85%
Pesticide Tank: 65%
Connectivity: Excellent
Historical Analytics
Temp.
Moisture
Quick Actions
Deploy All
Activate All
New Schedule
Emergency Stop
Weather Forecast
Now
28°C
3 Hr
26°C
6 Hr
25°C
Tomorrow
24°C


github.com/atharvpanwar-0/team-stark
atharvpanwar-0 / team-stark
Code
Issues
Pull requests
Actions
Projects
Wiki
Security
Insights
Settings
team-stark
Public
main
1 Branch
0 Tags
Add file
Code
About
sih project
Readme
Activity
0 stars
0 watching
0 forks
Releases
No releases published
Create a new release
Packages
atharvpanwar-0 Delete Drone User Dashboard directory
33 Commits
3D Model Image
Delete 3D Model Image/filr
7 hours ago
3D-Model-of-Drone.stl
Rename Smart AI Drone for Leaf-Level Precision Spraying.s...
2 hours ago
Prototype-Dashboard-Website.js
Rename main.js to Prototype-Dashboard-Website.js
7 hours ago
README.md
Update README.md
7 hours ago
drone-arduino.ino
Create drone-arduino.ino
1 hour ago
obj.mtl
Add files via upload
2 hours ago
tinker.obj
Add files via upload
2 hours ago
Type here to search
32°C Partly sunny
ENG
IN
4:38 AM
9/24/2025