TEAM JATAYUU

Problem Statement Title: Drone based surveillance of Tea Gardens

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Problem Statement

Drone based surveillance of tea gardens and other plantations :

Tea Gardens and other plantations are very big in size and cost of manual labour to oversee the garden is going up. A drone-based system which can reduce this manual supervision cost is required. A system which is easy to operate and uses computer vision to help control the issues in tea garden and plantation management is the requirement in need.

Proposed Solution

“JATAYUU - HEXACOPTER DRONE WITH AI-BASED SUPERVISION”

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FEATURE STACK

01

Live Surveillance and Monitoring: Live HD video feed from the drone to the supervisor station with in-feed interface for detection of humans and animals.

02

Autonomous Flight with manual control: Fully automated flights and Supervisor can also take control for on demand flight maneuvering during emergency or for sudden inspections.

03

Data Logging: Recording of flight and surveillance data using SD card and cloud backup for enhanced security backup, plant health and weather impact assessment.

04

Payload Delivery: Ability to carry and drop small items like first-aid kits during medical emergencies, safely using motorized locking system.

05

Live Human and Animal Detection System: In-feed detection and classification of humans and animals through drone camera.

06

Leaf Disease Detection System: Identification of Plant Leaf Species and Classification of Leaf Disease (if found in the leaf)

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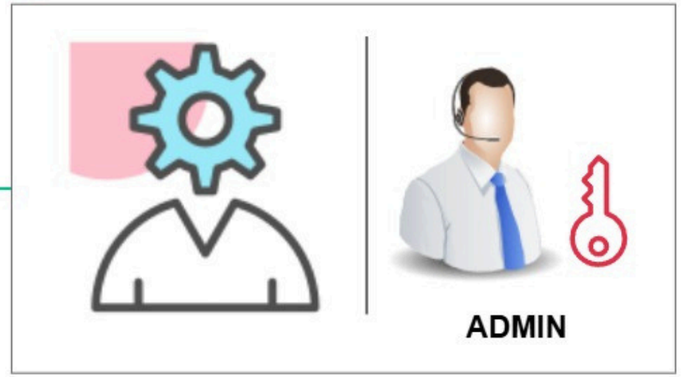
ARCHITECTURE

1 CONTROL CENTRE / PILOT



VIDEO LIVE FEED / DETECTION

2 JATAYUU SOFTWARE INTERFACE

3 JATYUU HEXACOPTER DRONE

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TECH STACK

- **Drone Frame:** Hexa-copter frame with motor mounts and landing gear.
- **Flight Controller:** APM 2.8 Flight Controller
- **Motors and ESCs:** 2212 DJI Readytosky 920Kv Motor and Simonk 30 Amp ESC's.
- **Power System:** Pro Orange Lipo 4500 mAh Battery with Battery management system (BMS) for monitoring and safety.
- **Camera System:** 12 MegaPixel HD camera for high-quality video capture. HDMI-to-AV converter for video signal conversion.
- **Video Transmission:** SpeedyBee TX800 live video feed transmitter/Wi-fi Based
- **Communication Module:** ESP32 for Internet connectivity. 2.4GHz or 5.8GHz transmitter/receiver for real-time controlling.
- **Ground Station:** Laptop or tablet for mission control software and live feed monitoring. Radio controller for manual operation.
- **Additional Payloads:** Thermal imaging camera and audio systems.
- **GPS Module:** Neo-M8N Precise location tracking for automation and waypoint navigation.

Video Streaming Protocol: MJPEG (Motion JPEG) over HTTP to transmit video feed to computer via a Wi-Fi connection. This is particularly beneficial for immediate visual feedback, needed for detection over live a broadcast.

Telemetry and Control Interface: MAVLink for bidirectional communication between the drone and the ground station computer.

Cloud Storage: iCloud Storage for storing large amounts of surveillance data securely.

Object Detection and Tracking: YOLO (You Only Look Once) to identify humans, wild animals, pests, or anomalies in the video feed. And to detect leaf-disease using

YOLO Specifications-

- **Live Video-Feed Detection System:** YOLOv5
- **Leaf Disease Detection System:** YOLOv3, YOLOv5, YOLOv8

Prototype Gallery

LINK FOR WORKING MODEL : https://youtu.be/lFX7N4BvQs8

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Use Cases :

Improving Productivity

Monitoring helps supervisors track workers' activities and ensure optimal performance. It also allows for the identification of inefficiencies in work processes.

Monitoring Worker Safety and Preventing Illegal Activities

Workers often work in challenging and remote environments with valuable raw materials like tea leaves, machinery, and equipment. Surveillance ensures safety and prevents theft and other illegal activity.

Environmental Monitoring

Drone based surveillance systems can also track weather patterns or other environmental factors that may affect the tea plantation.

Show Stoppers :

Low Battery & Signal Loss

Optimized battery management for extended surveillance sessions.
Return-to-Launch (RTL) feature for automatic return to the base in case of low battery or loss of signal.

Motor Failure / System Failure

Hexa-copter design for stability and redundancy in case of motor failure.
Emergency landing protocol during system failures.

Weather Proof Operation

As tea gardens have constant rainfall, the drone is equipped with rain resistant design and can operate efficiently under rainfall.

Detailed Business Model

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Revenue Model

Hardware Sales

- **Base Model:** Drones with all basic integrated cameras, sensors & AI capabilities.

Live Surveillance and Monitoring	**Manual Flight Control**	**Data Logging**

- **Model Variety:** Different drone models based on range, payload capacity, and automation features.

Service Subscriptions (Freemium Model)

Plan	Extra Features	Pricing Model
Basic (Free)	Live Surveillance | Manual Control | Data Logging.	Free with limited Storage
Standard	AI Detection | Automated Flight | Audio Warning | Unlimited Cloud Storage | Payload Delivery Support	Subscription-based
Premium	Custom AI Models | Priority Support | Real-Time Alert System | Advanced Obstacle Optical Avoidance System	Higher-tier Custom Pricing Model

Maintenance & Upgrade Fees

- **Annual Maintenance Plans:** Regular servicing, firmware updates, and performance checks.
- **Hardware Upgrade Plans:** Customers can upgrade camera modules, flight controllers, or batteries.
- **Service Center Charges:** Repair services for damaged drones (hardware and software issues). On-demand technical support and emergency repairs.

Customization Services

Clients can request specific features like :

Optical camera:

- There is a big variety of optical cameras from compact fixed lens, action video cameras, DSLRs up to cinema cameras like REDs.
- Used for - for high definition photographic inspection.

Thermo-graphic/ IR cameras :-

- Senses radiation and helps in detecting heat signatures offers a lot of opportunities in finding everything from heat leaks, broken solar panels to runaway life stock.
- Used for - inspection of housing and solar cells, search and rescue, wildlife protection.

Particle sensors:-

- These specialized devices sense emissions/rays of radiation, gas, environmental services electromagnetic, vapor and other emissions.
- Used for - environmental services

Customization Services

Multispectral / hyperspectral cameras:-

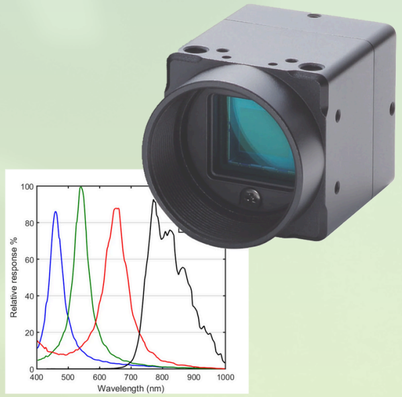
- These sensors enable the operator to combine different areas of the precision agriculture, electromagnetic spectrum to interpret the recorded data. Multispectral cameras capture visible light (red, green and blue), heat (infrared) and a small range of the UV-spectrum (ultraviolet).
- Hyper-spectral cameras offer a finer resolution of the respective bands. The information gained from these data can be used in agriculture, forestry and mining.
- Used for - Precision agriculture, crop health monitoring.

Laser scanner / LIDAR / LADAR:-

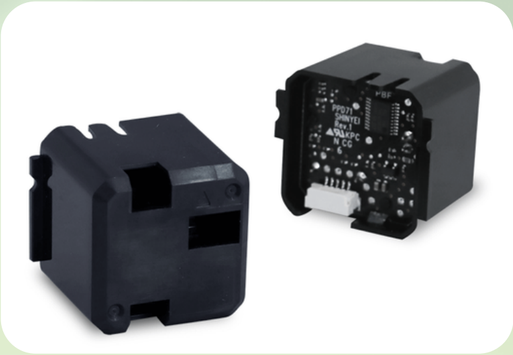
- Laser scanners or LIDAR (Light Detection And Ranging) is a surveying technology. Here, a laser is used to measure distances high resolution mapping and point clouds can be generated subsequently. This technology is used as a tool for surveying and to produce high-resolution maps.
- Used for - surveying, high resolution mapping

Customization Services

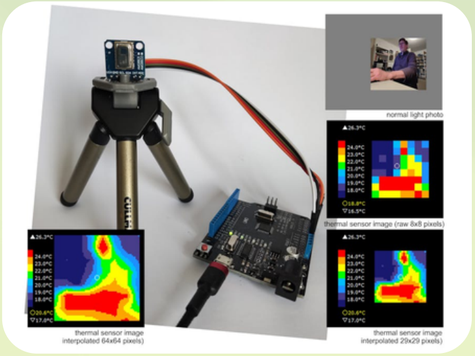
Multispectral camera



RGB Camera



Particle Sensor



Thermo-Graphic camera

Optical camera

LIDAR/LADAR

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Future Prospects

01

Audio Announcements and Warnings:
Built-in speakers for delivering messages or instructions to workers and issue warnings during storms and animal intrusions.

02

Geofencing and Obstacle Avoidance:
Restricting the drone to operate within specified boundary using GPS and sensors for collision prevention with trees, animals or other obstacles.

03

Real Time Alert System:
Attendance reports and emergency notifications sent through phone to supervisor during animal intrusion and medical emergencies.

04

Thermo-graphic/ IR cameras :
Senses radiation and in detecting heat signatures. Used for - search and rescue, wildlife protection.

05

Laser scanner / LIDAR / LADAR:
Used to measure distances high resolution mapping and point clouds can be generated subsequently. Used for - surveying, high resolution mapping.

05

RGB & Multi-Spectral Sensor :
For a detailed overview of crop health which includes crop growth, spot disease and pests, and track crop emergence.


Thank You !