K-Hawk

Agri Drone

ABSTRACT:

There are too many technologies involved in today's Agriculture, out of which spraying pesticides using drones is one of the emerging technologies. Manual pesticide spraying causes many harmful side effects to the personnel involved in the spraying process. Exposure can range from mild skin irritation to birth defects, tumors, genetic changes, blood and nerve disorders, endocrine disruption, coma, or death. The WHO (World Health Organization) estimated one million cases of ill-affected when spraying pesticides in the crop field manually. This paved the way to design a drone-mounted spraying mechanism having a pump, a specific storage capacity tank, nozzles to atomize in a fine spray, an octocopter configuration frame, a suitable landing frame, a few Brushless Direct Current (BLDC) motors with suitable propellers to produce required and suitable Lithium- Polymer (LI-PO) A First- Person View (FPV) camera and transmitter can also be fixed in the drone for monitoring the spraying process and also for checking pest attacks on plants. This pesticide spraying drone reduces the time, number of laborers, and cost of pesticide application. This type of drone can also be used to spray disinfectant liquids over buildings, water bodies, and highly populated areas by changing the flow discharge of the pump.

1. INTRODUCTION:

The Indian Agricultural sector is the most important as it amounts to a staggering 18% of India's Gross Domestic Product (GDP) and provides employment to 50% of the national human workforce. Our country is dependent on agriculture so much, and has yet to tap into the real potential of agriculture, because of improper methods of monitoring crops and the irrigation patterns and the pesticides required to be applied. the world witnessed a significant increase in the number of used drones, with a global and continuous rise in the demand for their multi-purpose applications. The pervasive aspect of these drones is due to their ability to answer people's needs in India, there are over 35 drone start-ups that are working to raise the technological standards and reduce the prices of agricultural drones. The effects of pesticides on humans while spraying them are stinging eyes, rashes, blisters, skin irritations, blindness, nausea, dizziness, diarrhea, and death. Exposure to pesticides in agricultural work can cause serious risks to the respiratory system causing chronic cough, dyspnea, wheezing, and expectoration, decreased lung capacity, asthma, and bronchitis. Many people lost their lives or suffered from health-related issues till their death, and as they are poor, they cannot afford the medical expenses of the treatment for their disease.

1.1 Drone Laws in INDIA:

General:

Unless exempted from a unique identification number required under these rules, no person must operate an unmanned aircraft system without first registering it on the digital sky platform and receiving a unique identification number.

All unmanned aircraft systems for which a unique identification number has been issued under these rules must be registered with the Director-General.

The person operating an unmanned aircraft system is responsible for ensuring that the unmanned aircraft system complies with a valid type certificate

1.2 Agriculture Drone Laws:

India is a global agricultural powerhouse. The agriculture industry accounts for roughly 18% of India's total GDP (Gross Domestic Product). One of the limiting elements in the expansion of this sector has been a lack of access to innovative agricultural technologies such as drones. Agriculture drones may be allowed to apply pesticides under a new SOP (Standard Operating Procedure) dated July 16, 2021.

The first set of Indian drone legislation was published by the DGCA (Directorate General of Civil Aviation) in 2018. The UAS Rules, the second set of drone regulations, were published in March 2021. However, both rules make using commercial drones in agriculture a time-consuming and difficult task.

1.3 Important crops of Andhra Pradesh:

Andhra Pradesh state is blessed with suitable weather to produce varieties of crops. The farmers of Andhra Pradesh practice multiple cropping patterns to improve the growth of agricultural production. Some of the important crops that are grown in the Andhra Pradesh state are Rice, Wheat, Jowar, Bajra, Maize, Minor millet, and Coarse Grain. Andhra Pradesh also produces other important cash crops like Groundnut, Castor, Pulses, Sunflower, Oilseeds, Cotton, and Sugarcane which help the state to earn huge amounts of revenue. The Department of Agriculture under the Andhra Pradesh Government plays a key role in improving India's production and quality of agricultural goods. In addition to enlightening the farmers on the various modern techniques of producing crops, the Department of Agriculture also provides high-yielding seeds, pesticides, and fertilizers to the farmers.

1.4 Cropping pattern in Andhra Pradesh:

The major crops grown in the Kharif season are cotton, paddy, and groundnut and in the rabi season, the major crops are sunflower and paddy. The other main crops in the state are Black gram, Tobacco, and Sugarcane. Agriculture in Andhra

Pradesh is very vast. There are About “62% of people” in Andhra Pradesh in the agriculture stream. The Visakhapatnam in Andhra Pradesh is the largest food crops area and is the main cropping area in Andhra Pradesh. The crop like

‘Bajra’, ‘Jowar’, ‘Maize’, ‘Ragi’, ‘Castor’, ‘small millets ‘, ‘Cotton’, ‘tobacco’, and

‘Sugarcane’. Rice is the major food crop that contributes about 77% of food grain agriculture.

1.5 Types of Insects that are Leading Farmers to make debts

Herbivorous insects destroy one-fifth of the world's total crop production annually.

Stem borer affects Crops like Rice, sorghum, finger millet, maize, pearl millet, sugarcane, mango, fig, rubber, jackfruit, eucalyptus, and mulberry which leads to yield loss of up to 10-48 Bollworm affects Cotton, chickpea, pigeon pea, sunflower, tomato, and its Larva causes damage Later buds, flowers, and bolls

Fruit & shoot borer Larva bores into tender shoots in early stages and causes "dead hearts". And affects crops like Brinjal, potato, tomato, maize, sorghum, cotton, sunflower, pigeon pea, chickpea, field beans, and roses. It causes nearly 15 to 90% of the loss

Thrips Eggs are laid on or just under the leaf tissues. and suck the oozing sap; sometimes even the buds and flowers are attacked. Infested leaves start curling and. affecting the crops such as Groundnut, cotton, chilies, roses, grapes, citrus, pomegranate, tea, grapevine, castor, and cotton which leads to a 25-50% loss.

Pod-sucking bugs Female lays 15 eggs into the spongy stem. As the internal contents of pods are devoured the yield of pulses is considerably reduced. The Crops Affected by it are Pulses, safflower, chilies, sorghum, groundnut, tomato, and cotton. It causes nearly 14-100% loss in yield...

Weevil Adult beetles feed on leaves or tree trunks and the grubs feed on roots and leading to the wilting and death of plants These insects affect yield loss up to 48% in crops like coconut, jute, cotton, sorghum, pearl millet, maize.

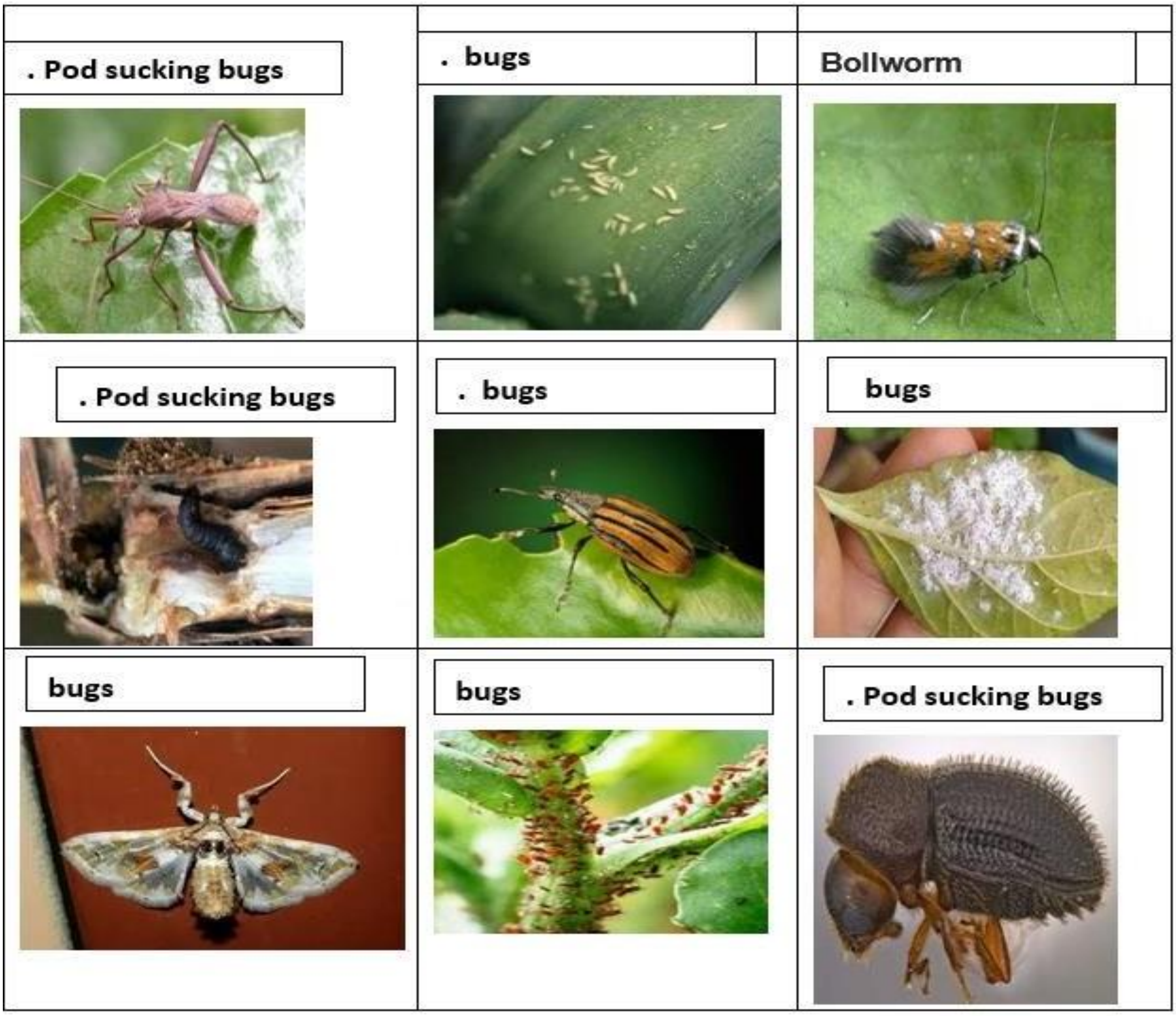

Fig: Example of insects in farmlands

2. ORIGIN OF THE PROBLEM:

Agriculture is the leading business for the application of drones. Given the huge number of hectares of land that are given over to agricultural activities and the remoteness (i.e., lack of wired or Wi-Fi infrastructure), this is perhaps not surprising. Drones are inexpensive and reliable. What has been missing up to now is the ability to add actionable insights into the data captured by drones One of the most critical uses of drones in agriculture is their flexibility to move around in swift motions and maneuverer to the destined locations. This ability of drones helps spray fertilizers and insecticides to nurture crops and provide them with the needed nutrients. Such reinforcements allow crops to be healthy and flourishing. The drone operators are free to monitor the drone spraying fertilizers that keep insects, pests, and worms away and increase crop life longevity. In its entirety, drones and their applications have helped ease the cumbersome process attributed to crop fertilization. Their enterprising and potent nature helps farmers a great deal with bountiful tasks and operations.

2.1 Problem Statement:

In this century, humankind has made fantastic advancements in technology, and pesticides and fertilizers play a critical role in controlling insects and increasing crop yields. Spraying pesticides and fertilizers by hand causes tumors, hypersensitivity, allergies, and other illnesses in people. The challenge is designing and developing a drone that can automate pest infestations, pesticide spraying, and field tracking with the help of deep learning and IoT technologies.

This led to the design of a drone-mounted spraying system, including a pump, particular storage tanks, nozzles capable of atomizing fine sprays, an octocopter frame, suitable landing gear, and a few Brushless Direct Current (BLDC) motors with propellers capable of producing lithium-polymer batteries. A First-Person View (FPV) camera and transmitter can be attached to the drone to monitor the spraying process as well as to check for pest attacks on plants.

3. OBJECTIVES:

1. To detect insects in a field with the help of drones, pinpoint their exact location, and record that data.
2. To spray more pesticides on the area using K-Hawk where there are more insects according to the need.
3. To provide an effective way to deal with insects with minimum cost and reduce the usage of pesticides.

4. REVIEW OF THE STATUS OF RESEARCH AND DEVELOPMENT

Precision agriculture, which utilizes GPS and big data to manage crops, has been touted by drone proponents for years as a method to boost crop productivity while addressing water and food shortages. Unfortunately, until recently, drones did not have a substantial impact on

agricultural methods. Drone applications in agriculture and precision farming have received a lot of attention recently. Drones delivering agricultural intelligence for both farmers and agricultural consultants are changing agricultural practices, from the ability to image, recreate, and analyze individual leaves on a corn plant from a height of 120 meters to getting information on the water-holding capacity of soils to variable-rate water applications.

The development of quadcopter UAVs and the spraying process are described in this work. We also describe how to integrate a sprayer module into a quadcopter system in this study. The proposed solution entails creating a prototype with low-cost components such as a BLDC motor, Arduino, and ESC wires.

4.1 Pasquale Daponte et

In that instance, the drone must fly following a flight route defined in terms of waypoints and height. As a result, the drone must include positional measurement equipment on board (e.g., Global Navigation Satellite System, GNSS). For determining its position about the waypoints It also includes an altimeter. For flying at constant flight heights, use a barometer, laser altimeter, or ultrasonic sensor.

4.2 Autonomous Drone for Smart Monitoring of an Agricultural Field

The study proposes employing an unmanned aerial vehicle (UAV) or a drone with swarm communication capabilities to monitor agricultural fields and assist farmers in achieving consistent and lucrative crop production. The paper's control system is integrated with the drone, which was built from the ground up. The drone's entire body is comprised of lightweight materials derived from recovered ocean trash. The fundamental idea is to employ swarm communication amongst drones to divide the agricultural area into separate zones, with each drone monitoring one of them. A CC2520 RF transceiver and a GPS module integrated with the drone’s control system are used for swarm communication. The purpose of drone swarm communication is to avoid collisions among drones that are monitoring various portions of the field. With the help of the GPS module, the drones may also follow pre-defined tracks on agricultural fields. Sensors are used in the drone's control system to keep pests out of the agricultural field, monitor the water level in the field, and evaluate the health of the crops using optical crop sensors. The drone is primarily utilized to relieve a farmer's load of checking their fields regularly.

4.3 Agri-Drones

Students at the Indian Institute of Technology (IIT) Guwahati have created a drone with an automatic sprayer to sanitize huge regions and prevent the spread of COVID-19. The students, who are also the founders of RACERFLY, a start-up company, approached the government of Assam, offering to assist in the fight against the coronavirus. With their sprayer method, they've managed to prevent a pandemic. Because combating COVID-19 necessitates social isolation, the sprayer is essential. Only one person is needed to deploy and operate the system. Monitoring from a single location, obviating the requirement for many cleaners to do the job manually disinfectants are sprayed Additionally, these drones can be used to film videos.

4.4 Drones in Agricultural Monitoring

Precision agriculture is achieved and improved with the use of agricultural drones. In recent years, precision technology has fueled the agricultural shift. Agronomists, agricultural engineers, and farmers are likely to switch to UAVs (unmanned aerial vehicles) to obtain more effective crop observations and to schedule and control their activities more precisely, as agronomists, agricultural engineers, and farmers switch to UAVs (unmanned aerial vehicles) to obtain more effective crop observations and to schedule and control their activities more precisely. According to the Digital Transformation Monitor, introducing new technologies to agriculture, such as the Internet of Things ('IoT), Big Data, and Artificial Intelligence, is one of the keys to meeting increased food demand and improving existing water usage levels.

5. Motivation:

After observing the existing drone in the agricultural domain, we came to know that they are attaching sensors in the field and then they are maintaining a connection with the drone so if they detect some problem with the sensors in the field it transfers the details to the drone then the drone will get into the action. But our project is a bit different from the above ones, we are now attaching a heat sensor every living organism produces heat, but the heat differs from organism to organism so with the help of those values we are going to detect the heat level of insects with that we are going to spray the fertilizers accordingly. In this way there is no need for extra sensors on the field directly we deal with the drone.

6. Methodology:

Nowadays, technology became a metaverse and wields as if it had grown a hotfoot. And, in the present Scenario, everything which we were using is utmostly semi-automated and some are fully automated. In the era, reports of drones started appearing around 1998 and increased dramatically in the last decade. The use of Drones is emerging in most sectors like Virtual Reality, Photography, Agriculture, and many more. We were on the mark to implement our Problem Statement with the help of Drones integrating with Thermal Sensors.

Thermal Sensors enables the drone to analyze the invisible temperature data, it makes it possible to collect radiometric data over wide areas and hard-to-reach place. Whereas Drone is a flying robot that can be remotely controlled or fly autonomously using software-controlled flight plans in embedded systems, which work in conjunction with sensors and GPS (Global Positioning System).

Traditional field inspecting for pest infestations is often expensive and time-consuming; it may be practically challenging, such as when a large acreage is involved, when the arthropod pests are too small to see with the naked eye, or when they reside in the soil or tall trees. Hence, one of the main drivers for the implementation of drone-based remote sensing technologies into agriculture is the potential time, saved by automatizing crop monitoring with Remote Sensing.

Fig: Diving the area into parts firstly, consider each acre and divide it into 4 divisions (A, B, C, and D). The drones scan each division with thermal Sensors, record the data for all the divisions, and summarize the Arthropod pest percentage using Remote Sensors. Finally Analyzing the data and which division consists of the Maximum percentage of fests requires a high rate of pest infestations and vice-versa.

After, Scanning the Acre we note the data for each of the divisions and can finalize the respective amount of pest infestations required for each Division.

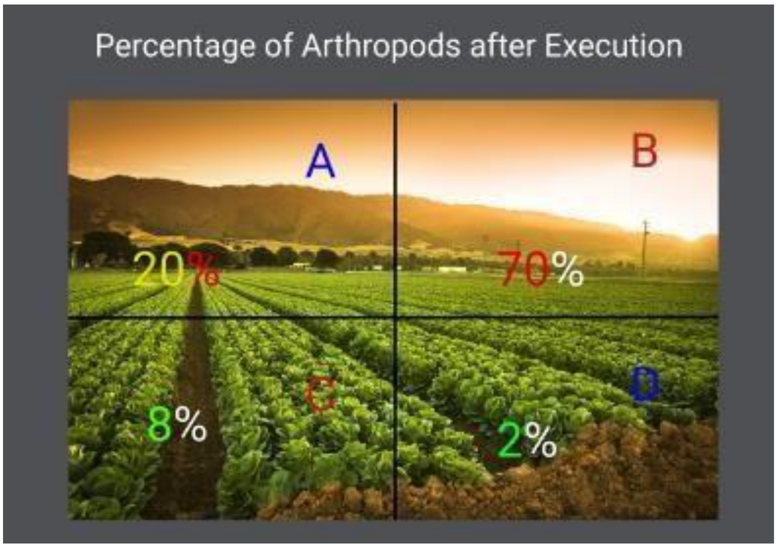

Fig: after using K-Hawk

7. Work Plan:

TIME SCHEDULE:

Months	WORK THAT HAD TO BE DONE
WEEK 1-2	Collecting data
WEEK 3-4-5	a survey of the literature
WEEK 6-7-8	Selection of the resources
WEEK 9-10-11	Working on heat senor
WEEK 12-13-14	Working on weightlifting
WEEK 15-16-17	Implementation of a framework forbetter access control
WEEK 18-19	Building prototype model
WEEK 20-21	Testing the drone
WEEK 22-23	drone Working on results for better validation and approval
WEEK 24-24	Documentation
WEEK 25-26	demo presentation
TOTAL	7 months

8. BUDGET ESTIMATION:

ITEM	QUANTITY	COST
DRONE	2	3,00,000
HEAT SENSORS	3	3,00,000
LAPTOP	1	1,00,000
INFRARED-CAMERA	2	1,20,000
SENSORS	6	80,000
CONSUMABLES		1,00,000
MISCELLANEOUS		2,00,000
	TOTAL	12,00,000

9. JUSTIFICATION FOR THE PROPOSED EQUIPMENT:

These are the hardware and software requirements for the project:

1) Raspberry pi
2) Heat sensor
3) Customized drone
4) Spraying tank
5) Laptop
6) Camera with high resolution
7) Jupiter notebook
8) Software for Deep Learning algorithms

A customized Drone is required to carry a Spraying tank, so this must be able to lift more weights, sensors are required for the detection of heat released by the insects, a high-resolution camera is required for capturing images of insects in the land, and laptop with a high ram and storage is required to run algorithms for a long time

10. CONCLUSION:

Manual spraying of pesticides causes many harmful side effects involved in the spraying process, performing fields inspections for pest infestation can be both times consuming and expensive, it may also be challenging when the area of the property is large and when insects are too small to see when they reside in soil or trees, to overcome these problems our proposed K-Hawk model provides a more effective way to deal with these problems with minimum cost and in less time.

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ANNEXURE:

Pets and diseases:

According to recent statistics in the horticulture sector.

The pests & diseases on Rabi and Kharif standing crops have been reported below.

Crop	Intensity of Pest / Diseases incidence	Major Districts Affected	Area Affected (ha.)	Area Treated (ha.)
Paddy (Kharif)	Leaf folder, BPH, False smut, Blast	Guntur,Kurnool	17525	17525
Paddy (Rabi)	Leaf borer, Gall midge	Chittoor, SPSR Nellore, Kurnool Ananthapuram	2629	1917
Maize (Rabi)	FAW	Chittoor, Kurnool	114	114
Redgram (Kharif)	Maruca leaf folder	Kurnool,Guntur	3088	3088
Bengalgram (Rabi)	Wet root rot, collar rot, pod borer	Kadapa, Kurnool, Ananthapuram	46005	3391
Blackgram (Rabi)	Helicoverpa	SPSR Nellore,Kurnool	1310	610
Greengram	Maruca	Kadapa	40	35
Horsegram (Rabi)	Maruca, Powdery mildew, YMV	Kadapa	406	338
Groundnut (Rabi)	Thrips	Kadapa, Chitttoor, Ananthapuram, Kurnool	559	468
Sunflower (Rabi)	Helicoverpa & Spodoptera	Kadapa	150	120
Chillies (Kharif)	Sucking pest, Root rot	Kurnool	51	51
Chillies (Rabi)	Sucking pest	Kurnool	20	20
Cotton (Kharif)	Sucking pest, Pink boll worm	Krishna, Guntur	16489	16239

PP section of Commissionerate of Agriculture, AP: Guntur.

Fig: pests and diseases in Andhra Pradesh