PROOF OF CONCEPT (POC) for Project Proposal

Project Reference No. - 46S_BE_0066

Project Title – "AERIAL AGRI-CIDES USING KINESICS"

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Introduction - In India, Agriculture is a major sector of our economy but still it is far short of western countries when it comes to adapting latest technologies for better farm output. Efficient use of pesticides can helpful to control plant pests and diseases to increase the crop yields.The use of agrochemicals can effectively enhance the quantity and quality of crops, however, it increases the environmental risks. An agricultural drone equipped with telemetry using a quadcopter is an unmanned aerial vehicle (UAV) that can be used in agriculture to enhance efficiency and reduce manual labor. Spraying technology aims to effectively and economically application of the precise quantity of the chemical to the set target with minimum threat for the environmental pollution.

Objectives of Project –

- To apply pesticides with precision and accuracy, ensuring that crops receive the correct amount of product, which can improve crop yield and quality.
- To cover large areas of land quickly and efficiently, which can reduce the amount of time and labor required for pesticide application.
- To reduce the need for manual labor, which can help protect workers from exposure to harmful chemicals.

Problem Statement –

- Most of the farmers in the developing countries like India will have small cultivating areas. They can't afford and adopt new technologies in farming their lands.
- The farmers have to carry the pesticide spraying bag which makes them get strained.
- The farmers are unable to evenly distribute the pesticides all over the farm.
- It consumes more time and manual power which leads to tiredness and brings many health issues as they directly expose to the fertilizers and pesticides that they are applying to their lands

Need for the project –

The need for agricultural pesticide spraying drones arises from the limitations of traditional methods of pesticide application, such as manual spraying or ground-based equipment.

Ideation (Right Solution) –

The ideation of agricultural pesticide spraying drones involved identifying the problem, conducting research and feasibility analysis, conceptualizing and designing the drone system, prototyping and testing, refinement and iteration, and commercialization.

Prototype –

The prototype is typically used to evaluate the drone'stability to carry out pesticide spraying tasks, assess the accuracy and efficiency of the spraying mechanism, and test the control system's functionality.

The prototype consists of :-

- Frame
- Spraying Mechanism
- Control System
- Power Source
- Sensors

Problems Faced –
Some of the problems faced in pesticides spraying include:-

- Inefficient application: Traditional pesticide spraying methods such as manual spraying or ground-based equipment may result in uneven application of the pesticide, leading to under or over application, which can result in crop damage or reduced efficacy.
- Labor intensive: Traditional pesticide spraying methods require significant labor and time, which can increase costs and reduce efficiency.
- Environmental impact: Pesticides can be harmful to the environment if they are not applied correctly. Runoff from over-applied pesticides can contaminate nearby water sources, causing harm to aquatic ecosystems and wildlife.
- Health risks: Pesticides can pose a health risk to farmers and workers who apply them manually. Prolonged exposure to pesticides can cause skin irritations, respiratory problems, and other health issues.
- Weather conditions: Traditional pesticide spraying methods are often weather dependent, meaning that they may not be effective during periods of high wind or rain

Fig 1. Pesticide Poisoning

Applications –

- They have the capability to spray insecticides and fertilizers on crops to nourish them and give them the nutrients they require.
- It helps to simplify the time-consuming process of agricultural fertilization.
- It helps in effective crop surveillance by inspecting the field ensuring farmers a timely harvest especially when dealing with seasonal crops and take active measures to improve the condition of plants in the field.
- It is especially effective in reducing the overuse of pesticides, insecticides, and other chemicals.

Fig 2. Crop spraying

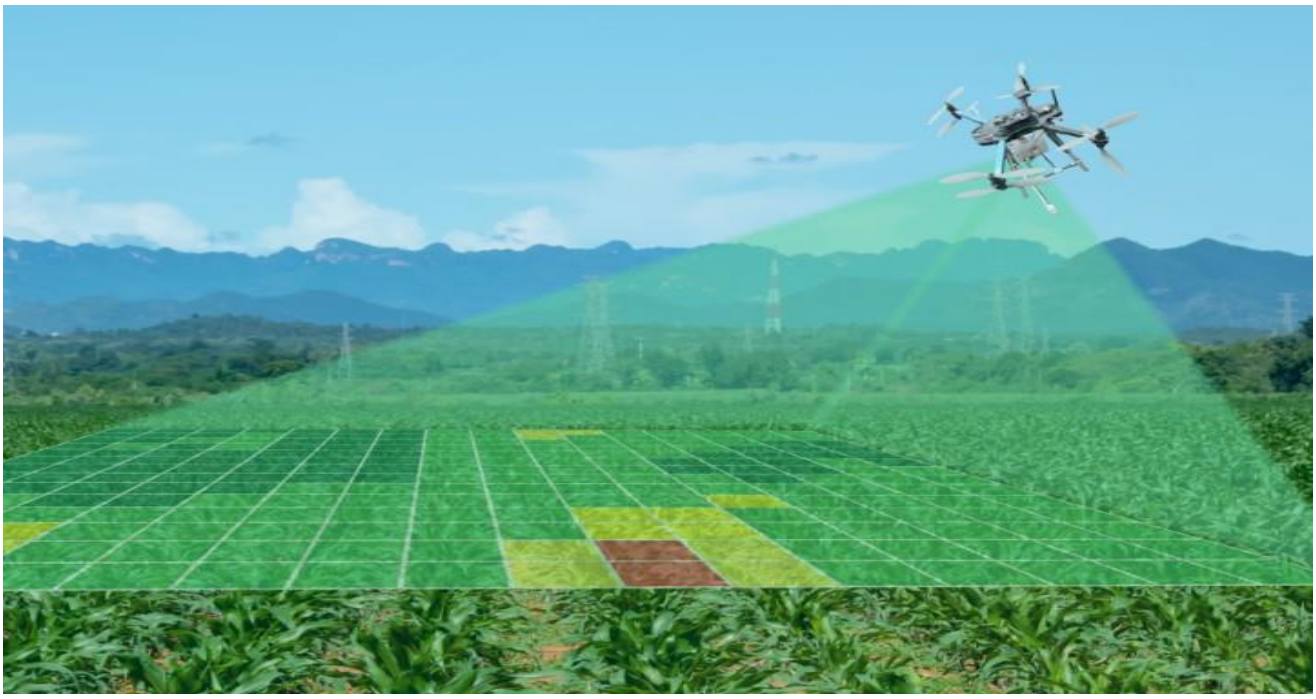

Fig 3. Crop Health Monitoring

Methodology –

The spraying operation can also be directly controlled manually with the help of transmitter at the ground control station. FPV camera and AV display units are helpful for providing live footage of spraying operation in the AV display at the ground control station.

- ADRUINO MEGA 2560: It is a micro controller which has 54 digital I/p O/p pins out of which 14 pins can be used as PWM pins. It allows inserting a new code, software running on the system.
- ACCELEROMETER ADXL335: The three axis accelerometer IC used to read X, Y, Z acceleration as the voltages. It will measure the amount of acceleration due to gravity and with the help of it we can find out the tilting angle.
- WIFI MODULE ESP 8266: The WIFI module uses the software serial port and the hardware serial port for uploading and debugging. The ESP 8266 is a transceiver module. It is of small size and low cost and will work on 3.3V and consumes current Upto250mA.
- LI-PO BATTERY: Lithium batteries are the preferred power resources for most electric modelers today. They offer high discharge rates and a high energy storage/ weight ratio. However, using them properly and charging them correctly is no trivial task.
- SERVO MOTOR: Servo Motor are used to control positions of objects, rotate objects. This can be used as a switch also. It has three coloured wires brown(GND), red (5v), and yellow(PWM).

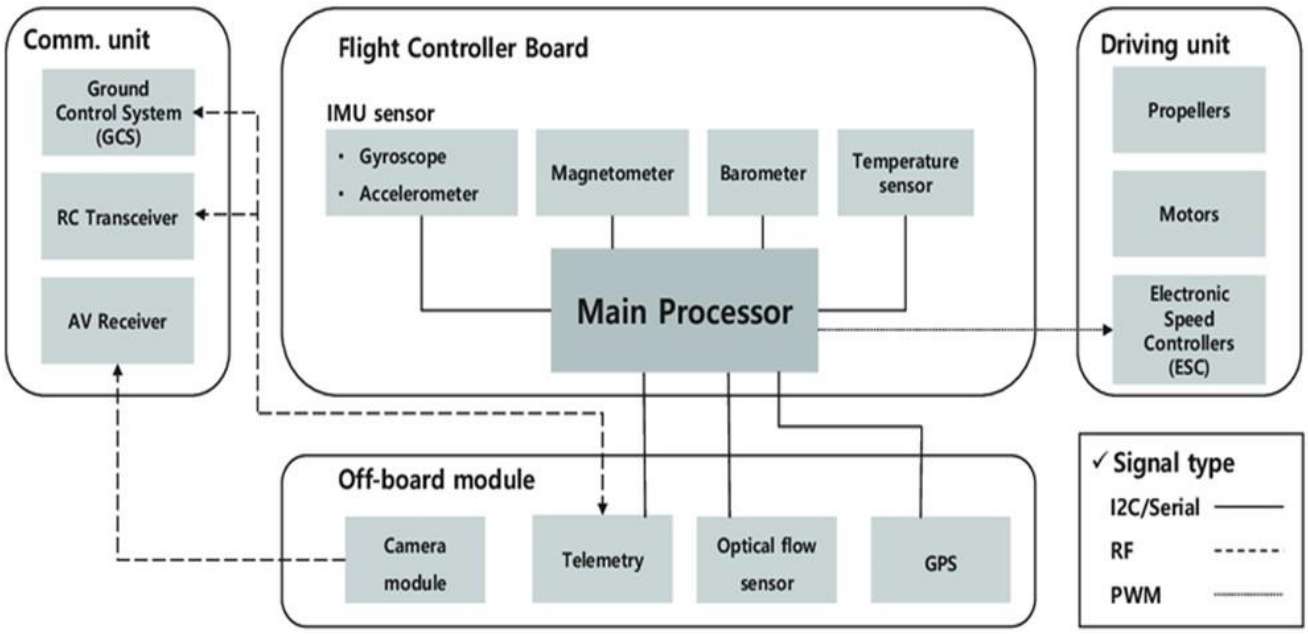

Fig 4. The sprayer module is integrated into the quadcopter

Methodology –

Fig 5. Working of drone

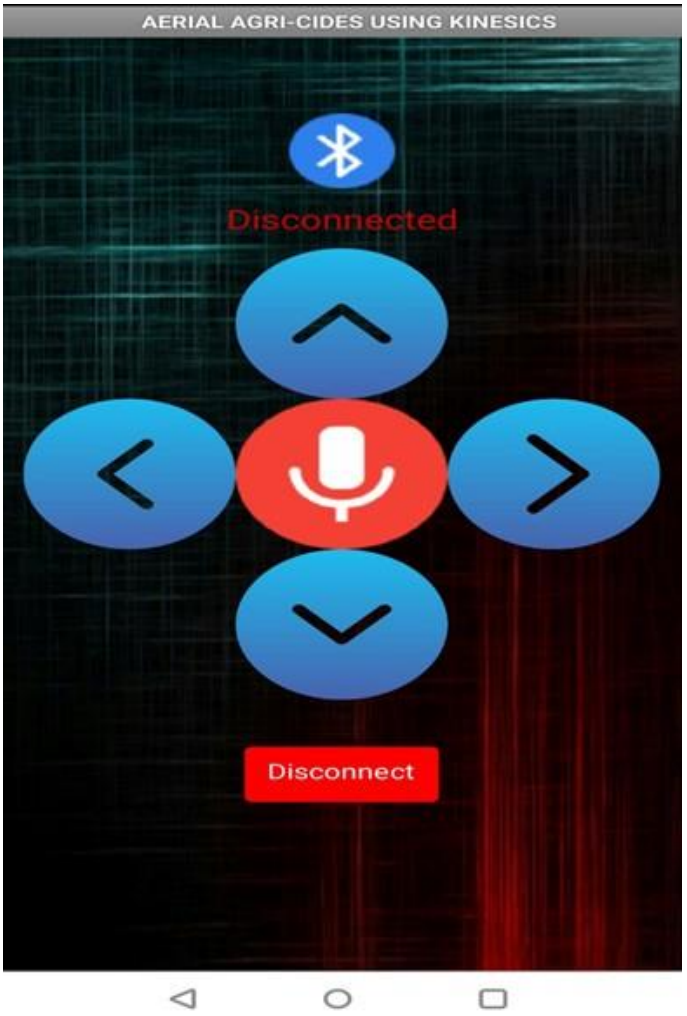

Fig 6. Android Application User Interface.

Conclusion and Future Scope - In conclusion, UAV drones have many potential applications and benefits, but their use must be carefully regulated and monitored to ensure public safety and protect individual rights. As technology continues to advance, we can expect drones to become even more advanced and versatile, with new capabilities and applications emerging in the years to come. It is essential to balance the potential benefits of drone technology with the need to mitigate its risks and safeguard public safety and privacy. The future of agricultural pesticide spraying drones holds tremendous potential for further advancements and adoption. Continued research and development efforts will focus on improving drone capabilities, such as increased payload capacity, longer flight endurance, and better resistance to adverse weather conditions. Further advancements in artificial intelligence and machine learning algorithms will lead to the development of drones capable of autonomous decision-making, route planning, and obstacle detection. Integration of advanced sensors, including hyper-spectral imaging, thermal cameras, and multispectral sensors, will enhance the capabilities of pesticide spraying drones. These sensors will enable precise identification of pests, diseases, and nutrient deficiencies, allowing for targeted and efficient pesticide application.

Photo –

Fig 7. Drone