IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 9, Issue 6, June 2021

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.542

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.542 |

|| Volume 9, Issue 6, June 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0906094 |

Innovative Drones for Effective Agriculture and Forestry

Anshika Priya[1], Dr..S.S.Nagamuthu.Krishnan[2]

PG Student, Department of MCA, RV College of Engineering, Bangalore, India[1]

Assistant Professor, Department of MCA, RV College of Engineering, Bangalore, India[2]

ABSTRACT: One of the latest developments is the increase in the use of small, unmanned aerial vehicles (UAVs), commonly known as drones, for agriculture. Application of crop production and protection is crucial in the high productivity of agriculture. On the farm, yield measurements, forage quality evaluation, weed control effectiveness, and plant nutrient status are some of the popular data collection methods used to measure these risks. The use of Agriculture Drones value proposition is rooted in the high labour cost of monitoring a wide area, rural expanse of agricultural land using traditional ground-based vehicles. In many environments, drones can cover 10 times more land than a ground-based observer in the same amount of time due to their sky-to-earth perspective and ability to fly over barriers. Drones can also be automated for routine assessments, negating entirely the need for human operation. The Agricultural Drones can be used to Monitor the Crop, Pesticides Spray, Disaster Damage Assessment, Crop Disease monitoring the flight of agriculture drones may be controlled with various degrees of autonomy, ranging from the remote control by an operator located in the vicinity to fully autonomous flight coordinated by onboard computers. Deploying Drones in large farm holdings with varying topographic climates; we will be able not only monitor the crops but also can spray Pesticides. They are also useful in situations where issues related to bacteria fungus, or pests are difficult to manage and require regular monitoring. In addition to cropland, drones can be deployed to monitor aquaculture. So, can be used to enhance the quality and quantity of its output.

I. INTRODUCTION

An Innovative Drones for Effective Agriculture and Forestry is an unmanned aerial vehicle used to help optimize agricultural tasks, increase crop yield, and monitor crop growth. Sensors and digital imaging capabilities with drones help farmers with a richer picture of their fields. This approach to farming management relies on observant, measuring, and taking action supported period of time crop and farm knowledge. It erases the requirement for approximation in fashionable farming and instead offers farmers the flexibility to maximize their yields and run a lot of economic organizations, all whereas enhancing crop production.

As farms and crop areas become larger because of the rise in demand, their management should be efficient to become additional economical. Agriculture drones can become very important in managing agricultural operations with exactness. As a result, agricultural consumption is calculable to extend by seventieth – drastically increasing the importance of exactness farming. Precision agriculture drones will type an oversized a part of the answer to this forceful demand increase. Drones will facilitate farmers with higher cognitive processes, analysis, and design – from the planting of crops to observance of their growth, health, and setting. As farms and crop areas become larger because of the rise in demand, their management should be efficient to become additional economical. Agriculture drones can become very important in managing agricultural operations with exactness. Agriculture drone technology has seen major growth over the past few years and additional and additional farmers area unit realizing however drones will aid in exactness farming operations. The best drones for agriculture are often programmed showing intelligence and have autonomous flight capabilities from beginning to landing. These drones will save farmers valuable time by automating the repetitive and long task of inspecting every plant or tree separately. this enables farmers to collect information with efficiency and pay longer analyzing crops and optimizing their agricultural management whereas the drone will the tedious task of inspecting crops. Farming drones will examine several aspects of crops like their growth, texture, setting, and pest conditions, to call many. when the drone observes crops and collects information, the info is then processed victimization programs based mostly around exactness agriculture. The farmer will then respond supported the info to optimize growth. Agriculture drones enable farmers to watch the condition of crops, and even a eutherian mammal, by air, in the period. this enables farmers to seek out issues quickly that might be troublesome or long to select up with ground-level examination. as an example, a drone will facilitate a farmer to establish that a part of their crop field is not being irrigated properly. Additionally, farmers will measure their crops at scale, whereas making crop

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.542 |

|| Volume 9, Issue 6, June 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0906094 |

maps at the same time – rising time and crop management. Drones with aerial thermal imaging capabilities is additionally a non-invasive thanks to discovering plant diseases and pests, likewise as observance greenhouses and nurseries. Agriculture drones will cowl giant areas in a very single flight whereas capturing multispectral and visual information. This enabled exactness farmers to trace crop growth, manage nutrient input, and create choices supported highquality, multi-sensor imaging and analytics. Agriculture drones have AN aerial advantage over different machine-controlled information assortment strategies, like a programmed tractor. The actual fact that drone's area unit mobile creates exactness agriculture very effectively. Ultimately, agriculture drones will facilitate exactness farmers to maximize their profitableness by victimization correct information to form fast and hip to choices regarding their crops and agricultural management.

II. LITERATURE SURVEY

In this paper, the authors have given detail about the implementation of Agriculture drones for automatic spraying mechanisms. In this paper, they gave a problem statement of the World Health Organization where it estimates that there are 3 million cases of pesticide poison each year and up to 220,000 deaths, primarily in developing countries and they also explain what precautions the farmer should have to use to avoid harmful effects of pesticides and fertilizing effects as well as cost-effective technology using components such as microcontroller to control the agriculture drones. The published paper is available at the journal IJRTI, Volume 2, Issue 6, 2017.[1]

In this paper they have explained about the design proposition for a multispectral system for interfacing with an onboard flight controller to synchronize data acquisition and obtain aerial images. They have given the proof of concept tested on several types of crop such as table grapes, asparagus, sugar cane and sweet potato, the obtained images were used to calculate the NDVI (Normalized Vegetation Index). [2]

In this paper, authors have given detail about the implementation of Agriculture wonder drones. They gave detail about the Quadcopter UAV and sprayer module and also discuss pesticide content to the areas that can't easily accessible for human beings. They discussed the use of multispectral cameras which is used to capture remote sensing images to identify the green field as well as the edges of the crop area. The total payload lift of their quadcopter is 8 kg. They used QGIS software for the purposed of analyzing the remote sensing images. The paper is available at International Academic Research, Journal of Engineering Sciences, Volume 1, Issue 1, February 2016.[3]

In this paper, the authors have given detail about the implementation of the Agriculture Wonder Drone System. In this paper, the wireless drone system based on flight-controlled board (FCB), GPS, Brushless DC motor, electronic speed control (ESC), wireless transceiver, frame, propellers, and battery, etc. They used a flight controller board for controlling the function of drones such as movement, lifting, positioning, etc. FCB is programmed in this project for handling different sensors such as GPS, Barometer, Accelerometer, Gyroscope, etc. and components such as motors. The drone was programmed to operate in two modes that are manual mode and autonomous mode. This paper was published by K. L. E. Institute of Technology, Hubballi, Project reference no.:39S_BE_0564.[4]

Description of the Innovative Drones for Effective Agriculture and Forestry

Precision agriculture, using GPS, GNSS and drones, maximizes the farm yield, and helps the farmer to see that crop is most suited as per the soil quality and geologic conditions. the utilization of technology conjointly warns the farmers earlier to require preventive measures just in case of unforeseen vagaries of nature.

While exactness agriculture isn't any a lot of a brand-new thought, however it's any undergoing transformations and embedding new technologies for higher optimization of agricultural issues.

Drones have a giant role to play in exactness agriculture and therefore the role of drones would solely increase and deliver the simplest quality outcome.

Drones fitted with high-resolution cameras and precise sensors are often flown over thousands of hectares of farms and gather knowledge, that can be utilized to map cuss harm, crop stress and per area unit yield. Drone imagination would assist the farmer to observe what is happening in his farm, while not the requirement of measure the farm all by himself or hiring folks for it.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.542 |

|| Volume 9, Issue 6, June 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0906094 |

The farmer would get the precise concept on that areas he ought to focus a lot of, wherever to portion a lot of resources, and whether or not or not the realm is suited to a specific crop or not, and what would be the chance of a high yield.
This would empower the farmers and mitigate uncertainty and vulnerability that invariably hovers over the agricultural sector. it is not that solely the massive farmers would like drone technology. As governments place a lot of stress on incentivizing the adoption of this technology and drones would be wide employed in agriculture, within the future, they'd be wide used as essential machines for cultivation.

Applications of the Innovative Drones for Effective Agriculture and Forestry
Soil and field analysis: Drones can be instrumental at the start of the crop cycle. They produce precise 3-D maps for early soil analysis, useful in planning seed planting patterns. After planting, drone-driven soil analysis provides data for irrigation and nitrogen-level management.

Planting: Startups have created drone-planting systems that achieve an uptake rate of 75 percent and decrease planting costs by 85 percent. These systems shoot pods with seeds and plant nutrients into the soil, providing the plant all the nutrients necessary to sustain life**.**

Crop spraying: Distance-measuring equipment—ultrasonic echoing and lasers such as those used in the light-detection and ranging, or LiDAR, method—enables a drone to adjust altitude as the topography and geography vary, and thus avoid collisions. Consequently, drones can scan the ground and spray the correct amount of liquid, modulating distance from the ground and spraying in real time for even coverage. The result: increased efficiency with a reduction of in the amount of chemicals penetrating groundwater. In fact, experts estimate that aerial spraying can be completed up to five times faster with drones than with traditional machinery.

Irrigation: Drones with hyperspectral, multispectral, or thermal sensors can identify which parts of a field are dry or need improvements. Additionally, once the crop is growing, drones allow the calculation of the vegetation index, which describes the relative density and health of the crop, and show the heat signature, the amount of energy or heat the crop emits.

Health assessment: It's essential to assess crop health and spot bacterial or fungal infections on trees. By scanning a crop using both visible and near-infrared light, dronecarried devices can identify which plants reflect different amounts of green light and NIR light. This information can produce multispectral images that track changes in plants and indicate their health. A speedy response can save an entire orchard. In addition, as soon as a sickness is discovered, farmers can apply and monitor remedies more precisely. These two possibilities increase a plant's ability to overcome disease. And in the case of crop failure, the farmer will be able to document losses more efficiently for insurance claims.

Crop monitoring: Vast fields and low efficiency in crop monitoring together create farming's largest obstacle. Monitoring challenges are exacerbated by increasingly unpredictable weather conditions, which drive risk and field maintenance costs. Previously, satellite imagery offered the most advanced form of monitoring. But there were drawbacks. Images had to be ordered in advance, could be taken only once a day, and were imprecise

Further, services were extremely costly, and the images' quality typically suffered on certain days. Today, time-series animations can show the precise development of a crop and reveal production inefficiencies, enabling better crop management.
The overall crop and plant health
Land distribution based on crop type
Current crop life cycle
Detailed GPS maps of current crop area

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.542 |

|| Volume 9, Issue 6, June 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0906094 |

III. ARCHITECTURE DIAGRAM

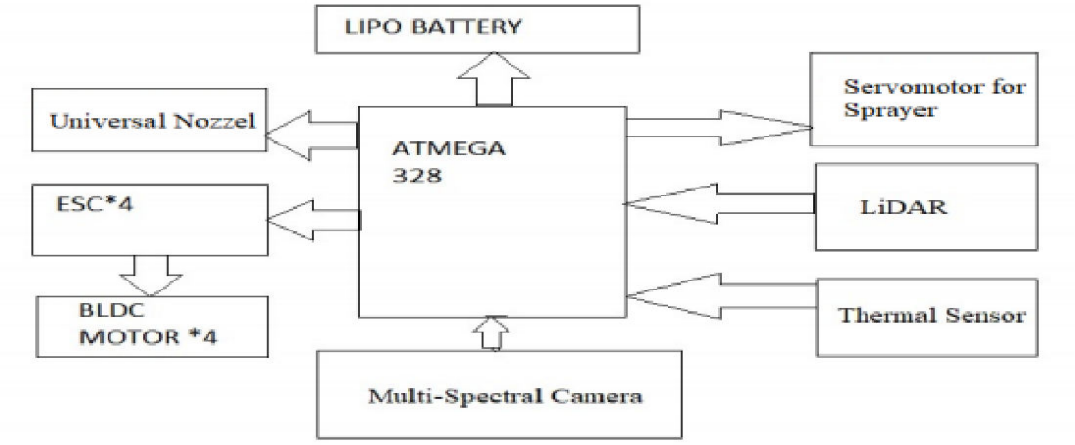

Figure 1.1 explains about the architecture of the Agricultural Drone system. In this system there will be a microcontroller (ATMEGA 328) which will be controlling the components like sprayer nozzle, Brushless DC Motor (BLDC) to fly the drone, Sensors, Multispectral camera. These devices will be powered by a Li-Polymer (LIPO) battery. The universal sprayer system uses to spray liquid as well as solid contents which are done by the universal nozzle which will help to spray the Pesticide and Fertilizer. Drone and sprayer will be controlled by Remote controller. MultiSpectral, LiDAR and Thermal sensor will capture the light of different wavelength. Captured images will be processed in Specialized software which will help in analyzing the crop health, detect pest and water level using different vegetation Index

IV. TECHNICAL SIGNIFICANCE

Details of the unresolved issue in Innovative Drones for Effective Agriculture and Forestry
In Agriculture many tools and technology are developed but they are not sufficient for now. The agricultural drone is developed to help farmer and save their time and optimize the use of pesticide and fertilizer.

These days a drone can lift the heavy weight which can be used to lift the pesticide and fertilizer and spray in the crop field. The drones available in market are very expensive these days because the industry of drone is just starting so it is new technology. The available drone used in agriculture are of specific purpose like a drone can be used either for Image capturing for analysis of crop and crop land or can be used to spray the pesticide and fertilizer.

So, a farmer who is willing to take help of drone in farming, need to purchase all type of drone which put lot of burden on the farmers. In this proposed system the same drone will be used for pesticide spraying and fertilizer spraying where the universal nozzle will greatly help to spray all type like liquid as pesticide and solid fertilizer. The same drone is used for image capturing to analyze the crop and crop land. The camera and sprayer component will be attached with the adjustable frame. When the sprayer component will be used that time the universal nozzle and tank can be fit with the help of adjustable frame and when farmer want to analyze the crops then the sprayer module is detached and multispectral camera and sensors are attached with the help of adjustable frame to drone.

V. TOOLS AND TECHNOLOGIES

Multi-Rotator Drone
Multi-rotors are UAVs that use more than two rotors with fixed pitch spinning blades that generate lift
Multi-Spectral Camera
Multispectral sensors capture data on the reflection of light energy off objects in the environment. It can also capture near-infrared radiation (NIR) and ultraviolet light invisible to the human eye.
Light Detection and Ranging (LiDAR) sensors

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.542 |

|| Volume 9, Issue 6, June 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0906094 |

Light Detection and Ranging (LiDAR) sensors use laser emitted light energy to scan the ground and measure the ranges of what bounces back. The end result is a rich set of elevation data that can be used to produce high-resolution maps and 3D models

Atmel 644PA

It takes the signal from 6050 MPU Acc/gyro (roll pitch/yaw) then passes the signal to Atmega 644PA IC. The Atmega 644PA IC unit processes this signal according to user-selected firmware and passes control signal to ESC. This signal instructs to make a fine adjustment to rotor rotational speed which in turn stabilizes multi rotorcraft. Hobby king 2.1.5 multi-rotor control board which uses the signal from radio system (RX) and passes the signal to the Atmega 644PA/IC via aileron, elevator, throttle and radar input. Once the information has proceeded, The IC will send varying signals to ESC in which in turn adjust the rotational speed of each rotor to induce controlled flight (forward, reverse, up, down, left, right).

LiPo battery

LiPo batteries are fully charged when they reach 4.2v/cell, and their minimum safe charge, as we will discuss in detail later, is 3.0v/cell. 3.7v is pretty much in the middle, and that is the nominal charge of the cell.

ESC controller

An electronic speed control or ESC is an electronic circuit that is used to control the speed of servomotor, its direction, and possibly also to act as a dynamic brake. Electronically speed controller (ESC) is often used on motors essentially providing an electronically-generated three-phase electric power low voltage source of energy for the motor which can be used to control the flight of drone by reducing or increasing the power. It also allows a much smoother and more precise variation of motor speed in a far more efficient manner than the mechanical type with a resistive coil and moving arm once in common use.

BLDC motors

Brushless DC electric motor (BLDC motors, BL motors) also known as synchronous DC motors or electronically commutated motors (ECMs, EC motors), are synchronous motors powered by DC electricity via an inverter or switching power supply which produces an AC electric current to drive each phase of the motor via a closed-loop controller. The controller provides pulses of current to the motor windings that control the speed and torque of the motor. The construction of a brushless motor system is typically similar to a permanent magnet synchronous motor (PMSM), but can also be a switched reluctance motor, or an induction (asynchronous) motor.

RF 2.4 GHz remote controller

Many embedded devices use handheld IR and RF remote controls. TVs and radios typically have Infrared (IR) remote controls. Most cars now have a radio frequency (RF) remote key fob. Wireless keyboards and mice use RF links at 27 MHz or 2.4 GHz. Instead of IR one we one also uses Node MCU. Less complicated Wi-Fi module is inbuilt in node MCU [6]

VI. CONCLUSION

The same drone will be used for pesticide or fertilizer spraying and for the crop and crop land analysis which will greatly reduce the cost and many farmers will be able to use this drone because of low cost and multipurpose use.

REFERENCES

1. Prof. P. P. Mone, Chavhan Priyanka Shivaji, Jagtap Komal Tanaji, Nimbalkar Aishwarya Satish "Agriculture Drone for Spraying Fertilizer and Pesticides", International Journal of Research Trends and Innovation, (ISSN 2456-3315, Volume 2, Issue 6). September 2017.

2.Juan Augusto Paredes, Jessenia González, Carlos Saito, Andrés Flores "Multispectral Imaging System with UAV Integration Capabilities for Crop Analysis", IEEE International Symposium of Geoscience and Remote Sensing (GRSS-CHILE)-2017.

3. S. Meivel M.E, Dr. R. Maguteeswaran Ph.D., N. Gandhiraj B.E, G. Sreenivasan Ph.D., "Quadcopter UAV Based Fertilizer and Pesticides Spraying System", International Academic Research Journal of Engineering Sciences, ISSN No. 2414- 6242, Volume 1,Issue 1, February 2016 .

4. Prof. K. B. Korlahalli, Mazhar Ahmed Hangal, Nitin Jituri, Prakash Francis Rego, Sachin M. Raykar, "An Automatically Controlled Drone Based Aerial Pesticide Sprayer", Project Reference No.39S_BE_0564.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.542 |

|| Volume 9, Issue 6, June 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0906094 |

5. Juan Augusto Paredes, Jessenia González, Carlos Saito, Andrés Flores "Multispectral Imaging System with UAV Integration Capabilities for Crop Analysis", IEEE International Symposium of Geoscience and Remote Sensing (GRSS-CHILE)-2017.
6. S. R. Kurkute, C.Medhe, A.Revgade, A.Kshirsagar, "Automatic Ration Distribution System -A Review". Intl. Conf.Proceedings of the 10th INDIACom; INDIACom2016; IEEE Conference ID: 37465 2016 on Computing for Sustainable Global Development, 2016.
7. S. R. Kurkute, C. Medhe, A. Revgade, A. Kshirsagar, "Automatic Ration Distribution System A Review". Intl. Conf on Computing for Sustainable Global Development, 2016. Swapnil R. Kurkute, Dipak Patil, Priyanka V. Ahire, Pratikha D. Nandanvar, "NFC Based Vehicular Involuntary Communication System", International Journal of Advanced Research in Computer Science, ISSN No. 0976- 5697 Volume 8, No. 5, May-June 2017.
8. Abdullah Tanveer, Abhishek Choudhary, Divya Pal, Rajani Gupta, Farooq Husain, "Automated Farming using Microcontroller and Sensors". International Journal of Scientific Research and Management Studies (IJSRMS), ISSN: 2349371, Volume 2, Issue 1, Page No.-21-30.
9. MIT Technology Review, "Agricultural Drones. Relatively cheap drones with advanced sensors and imaging capabilities are giving farmers new ways to increase yields and reduce crop damage", http://www.technologyreview.com/featuredstory/526491/agricultural-drones/, 2015.
10. S. R. Kurkute, Gopal Girase, Prashant Patil, " Automatic Energy Meter Reading System Using GSM Technology", International Journal of Innovative Research In Electrical, Electronics, Instrumentation And Control Engineering, ISSN: 2321-2004 (Online) Volume No.-4, Issue No.-3, IF- 4.855

INNO SPACE
SJIF Scientific Journal Impact Factor
Impact Factor: 7.542

doi cross ref

ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

निस्केयर NISCAIR

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

9940 572 462 6381 907 438 ijircce@gmail.com

www.ijircce.com

Scan to save the contact details