International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 05 Issue: 05 | May - 2021 ISSN: 2582-3930

Fertilizer Spraying UAV- A Review on Agriculture Drone.

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Abstract - In the world full of AI technology, we are so immersed in updating all the natural processes in mechanized process like; Reducing Human efforts and using machines like UAV instead. And at the same time, we need to take care about harmful chemicals present in pesticides. The chemicals can bio accumulate in the body over time, but at the same time these pesticides in agriculture are essential to maintain the quality of large-scale production. It is very important to improve the efficiency and productivity of agriculture by replacing labor with many technology's involved in agriculture, out of which spraying pesticides using drone is one of emerging technology. Pesticides may increase the crop productivity but it also affects human health. The WHO estimated 1 million cases of ill affected when spraying the pesticides manually in crop. So, in this paper we have studied some literature on drones in agriculture. This review aims to present a deeper understanding of how the drone-based data solutions can be a great help to the growing agriculture sector and farmers.

***Key Words*: AI Technology, Unmanned Aerial Vehicles (UAVS), Drone, Disinfectant, emerging technology.**

1.INTRODUCTION

India is an agriculture-based country, where 40% to 60% of the population is relying on agricultural fields. The increase in population is so drastically varying as it needs more an more improvement of productivity and practices in agriculture. The insects tend to damage the fields, which decreases the productivity and hence are killed. Frequently, the agriculture field faces destruction losses due to the; whether condition or disease in crops. The pesticides and fertilizers are some important components to kill insects and improve growth quality of a crop. Manually spraying the pesticides, and fertilizers affects humans leading to cancer, skin reactions, and other disorders. Hence, automatically controlling of fertilizer spraying, as well as crop monitoring can be done with UAV's, which is also used for many different applications. Unmanned aerial vehicles became cheaper because many control functions are often implemented in software instead of having to depend upon expensive hardware. This even allows multiple UAVs to be used for one application. during this case, the UAVs must have communication facilities in order that they will communicate with one another. Precision agriculture (PA), the intelligent crop production system, may be a scientific and modern approach to agriculture production within the 21st century.

The main advantages of using UAVs for smart agricultural applications include mobility of UAVs in variable weather conditions, ability to capture high-resolution pictures from different ranges (average range 50 to 100 meters) [16]. It is also possible to use UAVs for determining and monitoring the quality of crops, monitoring attacks attempted by pests/weeds/animals. The farmers and other stakeholders can access the data gathered through UAVs from cloud-based platforms remotely through apps from their smart devices which can help in predicting the yield of the crop, requirements like pesticides, fertilizers, seed sowing, etc. There are a few survey articles on UAV and agriculture. In one of the recent studies [17], the authors have explored the role of IoT and agricultural UAV in smart agriculture. The main emphases have been laid upon fundamental aspects of IoT technologies including intelligent sensors, IoT sensor types, networks and protocols, and how IoT can be integrated with UAV for the purpose of smart farming. so, in this paper we have focused on more and precise use of Drones/UAV for helping the growth rate of agriculture.

2. Importance of UAV in Agriculture

- Drones' technologies help farmers optimize the use of inputs such as, fertilizers, water, pesticides, etc. more efficiently. This allows timely protection of crops from pests, saves time for crop scouting, reduces overall cost in farm production, and secures high yield and quality crops.
- Drone technology has gotten most of the recognition in the industry because of its diversity and considered the future for the agrarian community. The military initially used them. However, other sectors quickly embraced unmanned aerial vehicles (UAVs) when they learned about its widespread applications.
- Drones don't merely enhance overall performance but also encourage farmers to solve other assorted barriers and receive plenty of benefits through precision agriculture. With the market for agricultural drones reaching a whopping $1.3 billion, UAVs (unmanned aerial vehicles) fill the gap of human error and inefficiency by traditional

farming methods. The purpose of adopting drone technology is to exclude any guesswork or ambiguity and instead focus on accurate and reliable information.

3. Literature Review

Vijayanandh R

In recent times, the deployment of unmanned aerial vehicles (UAVs) for practical applications is an emerging one. In order to build an UAV for critical application, the designers should reduce the general drawbacks of UAVs. The fixed wing UAV needs a long runway and it is not sufficiently expert in vertical take-off and landing (VTOL), which makes it unapproachable for certain applications. Another perspective, the rotary wing aircraft will have the VTOL ability but the disadvantages are its slow operational speed, greater the consumption of energy. Here, the proposed Tilt-Hexa-copter would be capable of VTOL feature and provide more stability high maneuvering capability during the critical surveillance. The main purpose of this copter is to provide wealthy surveillance with image processing techniques and gives updated information to the ground controller by taking necessary action at any critical environment. The CAD diagram of Tilt-Hexa-copter has been modeled in CATIA with calculated parameters. The image processing techniques for critical applications have been simulated using MATLAB.[1]

S. Ahirwar

The world population has increases day by day and projected to reach 9 billion people by 2050, so that the agricultural consumption will also increase. There is extreme need to fulfil the food demand of each and every person. Agriculture sector is the most promising sector, dealing with the lot of problems now a day's one of the main problems is labor unavailability for farming. Other problems or difficulties are extreme weather events, inadequate amount and inefficient application of fertilizer, infection, diseases, allergies and other health problems due to chemical application (fungicide, pesticide, insecticide etc.) or insect/ animal bite. The Use of advanced technologies such as drone in agriculture offer potential for facing several major or minor challenges. The major applications of drone in agriculture are irrigation, crop monitoring, soil and field analysis and bird control.[2]

Piotr Kardasz

This article shows the drones and possibilities of their using. First there was discussed construction of the drone, which the most important elements are frame, propellers, engine, system of power the electronic control and communication system. A drone is powered by batteries, which is the major drawback, because it is exhausted after 15 minutes of flight, causing a decrease drone on the ground. The lithium-polymer batteries are used for powering the drones. Then there were compared the military and civilian drones on selected examples. Military drones differ from civil of size and drive. They are bigger and powered by internal combustion engines. Civil drones are driven by electric motors. Next there were shown the possibilities of using the drones. They can be used by the public services (like police, fire brigades, border guards), by army, in industry, for taking photos and filming, in delivering shipments. [3]

Meivel, 2016

This paper discusses distance relays over-reaching in the presence of Thyristor Controlled Series Compensator (TCSC), one of the series connected Flexible Alternating Current Transmission System (FACTS) devices, on the far end of the second circuit of a double circuit transmission line, considering MOV operation. This is done by means of presenting the measured impedance at the relaying point and the ideal tripping characteristic. The measured impedance by distance relay is greatly influenced in the presence of TCSC on the line or even in the case of installing TCSC on the far end of the second circuit. The measured impedance depends on many factors including power system structural and operational conditions, the ground fault resistance, and TCSC compensation degree.[4]

Mehta, (2005)

Rotavator plays a vital role in helping the farmer to plough their land in a much faster and effective way. An attempt has been made to evaluate the performance of rotavator in dry land wet land condition. Wear analysis of blade was carried out for better life and performance in field. Hence any improvement in the field performance of the same would in turn, augment the productivity in the agricultural sector. From the study it was observed that the wetland operation required one or two passes to get desirable puddling index. The rate of work in dry land operation of rotavator while working in medium black soil was found in range of 0.330-0.350 ha/h whereas the depth of operation was found as 9.85-10.21cm in dry land condition. The field efficiency of rotavator was recorded as 77.18-80.60 %. The depth of puddle and puddling index was recorded as 19.68- 20.25cm and 78.84-80.63 %, respectively.[5]

Q. Lan. Y. and Huihui Zhang, (2014)

Field trials were performed to evaluate various techniques for measuring spray deposition and aerial drift during spray application to paddy field. The application of a spraying agent containing the fluorescent dye Rhodamine-B was applied by an unmanned aerial vehicle (UAV) which flew at a height of 5 m, a speed of 3 m/s, and the wind speed of 3 m/s. The results showed that because the downdraft produced by a helicopter rotor increased the penetrability of crops.[6]

UM Rao Mogili

The UAVs are able to cover up hectares of fields in single flight. For this observation thermal and multi spectral Cameras to record reflectance of vegetation canopy, which is mounted to downside of the quad copter. The camera takes I capture per second and stores it into memory and sends to the ground station through telemetry. For this wireless communication it uses MAVLINK protocol. The pictures capture in the visible five brands with different wave lengths: i.e. (1) Blue wavelength 440-510nm, (i) Green wavelength 520-590nm, (ii)

Red wavelength 630- 685nm, (iv) Red edge Wavelength 690-730nm, (v) near infrared wavelength 760 850nm.[7]

Sharmishta Desai, et. al, (2015)

We have found that the solution for the Problem Statement is to design a drone embedded with a camera which will scout the farm and detect infection. Here the conclusion is that for flight stability of the quadcopter, PID algorithm is the best and for image segmentation, edge detection can be used. Speed and direction control of DC motor is performed by PID control according to the calculated error share and the coordinates of the object. These operations continue until the object is captured.[8]

Suraj Shetty, et. al, (2016)

We have identified that they have developed a quadcopter type drone using brushless de motor, Electronic Speed Controller (ESC), Flight Controller, Lithium polymer (lipo) battery, Nozzle, Centrifugal motor pump, Storage tank. The sprinkler and tank are attached at the bottom of drone setup, through which the pesticide is sprinkled on the crop. This technology will help farmers to stay away from harmful pesticides while spaying which leads to damage health of farmers. The farmers who are physically disabled to move from one place to another by using these technology pesticides can be sprayed.[9]

Jeanette B. Barott, et. al, (2018)

We have demonstrated a number of modelling and analysis on the capabilities of the AADL, as it supports predictive model-based software systems engineering and addresses some of the critical requirements of real-time autonomous vehicle design and development. These capabilities spanned the range from Carly architectural system considerations such as bus loading, power consumption, and aircraft weight, through to the stimulability analysis of the runtime deployment configurations of threads executing on a target processor.[10]

Per Frankelius

We have concluded that the Intelligent Energy company presented a drone with hydrogen cells by which flight time can increase threefold compared with standard batteries. At the Agrotechnical fair 2017 the Inessive company showed a drone with power supplied not by batteries but by a wire from a vehicle such as a tractor. Drones will develop, and so will also sensors and system components. By means of hyperspectral remote sensing, it is possible to detect nags such as blight disease in an early stage of its development (Zhang et al. 2003). When the price on these sensors goes down, adoption will accelerate.[11]

Yallappa

Developed a drone mounted sprayer consisting of six BLDC motors mounted to hexa-copter frame to lift 5 kg payload capacity, LiPo (Lithium polymer) batteries, pesticide tank, pump, and supporting frame. The total weight of the drone mounted sprayer were calculated based on the parameters such as payload capacity, design of supporting frame, landing gear, design of fluid tank, selection motors, battery, propeller, flight controller, transmitter and receiver. This sprayer is very useful for spraying of chemicals on rice fields and orchard crops that reduces the cost of pesticide application and environmental pollution Further analysis were also done on the discharge and stress rate of the pesticides to determine the rate at which the fertilizer is sprayed uniformly to ensure it sprays everywhere in the crops. This method is handy because the human intervention of spraying the chemicals is reduced. The fig 3 shows the drone developed by the above method for spraying crops.[12]

Vrushabh Mohane

developed an agricultural sprinkler drone, a pesticide spraying machine to reduce the work of farmers. The UAV is operated manually and triggered by RF controlled nozzle. Multispectral camera will capture the image of the green crops to track the growth and edges are segmented for further analysis. The QGIS software is used to analyze the remote sensing images. The drone can be controlled using an android app which is receives the information using Wi-Fi module that is interfaced to the drone.[13]

S.Sabikan

Implemented USP platform that were used to develop the autonomous Remotely Piloted Vehicle (RPV) quadcopter to fit for any application. The development of quadcopter test bed configuration, capable of performing autonomous flight mission is presented in this paper. It is an easy, fast, and effectual approach to build up a quadcopter test bed for any research purposes. Among the many Open-Source Project (OSP) Arducopter platform is considered and basic functions of each component for both software and hardware were explained in detail. The unreserved Source Project platform is the most successful approach because of their flexibility in both hardware and software. This developed module was experimented in the outdoor real environment to test the elemental features of flight performances, to calculate the parameter such as altitude and attitude, trajectory mapping generation. Finally, the USP quadcopter platform is the complete framework of the developed quadrotor for any outdoor application or research application.[14]

Tejas S. Kabra

Introduced a quadcopter [QC] of low cost and low weight by further focusing on the arm design to enhance the farming efficiency. The quadcopter developed with lightweight aluminum body and simple arrangements lessen the issues in the farming field and to increase the precision in agriculture. These methods also reduce medical issues which are produced by manual splashing. This paper presented part of quadcopter with unique design of propeller, sprayer and piping system, pesticide container and stand serve to optimize the time of spraying and the weight of quad copter.[15]

DISCUSSION

From the above literature we can clearly say that many researchers have put their efforts to study the various technologies related to UAV's / Drones, and also find so

many different ways to overcome the problems faced in agricultural field. These are also very important aspects as for the better improvement of quality and quantity of crop production.

CONCLUSION

In this Literature, the architecture, adaption and usage of UAVs in agriculture have been explored and presented.
we can observe that many researchers are doing great work in order to help and develop the UAV/ Drone/ AI technologies. Potential case studies involving UAV's and spraying Drones in agriculture have been discussed. UAV technology cannot be replaced with any technologies yet for implementation purposes. The motivation of using Drone for spraying pesticides is an effective and an useful inventions. We have also explored various types of agricultural sensors identified several applications of UAVs in agriculture processes. Besides, we have identified key enabling requirements of UAVs in agriculture including acceptance of technology by farmers, accuracy of results, network availability, data storage, regulation of UAVs, and many others factors. For all these reasons, there should be an increment in the use of drones in agriculture. More-over, works described above proves that the affordable prize and vantage point that UAVs enable make them a valuable tool to be used in precision agriculture. Thus, the scientific work exhibits multiple worldwide successful applications over so many main crops, such as wheat, maize, rice, olives, fruit trees, etc.

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