ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijircce.com

Vol. 7, Issue 2, February 2019

A Survey on Agricultural Drones Using IOT

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ABSTRACT: The main objective of this paper is that the Drone used for agricultural surveillance is an unmanned vehicle used for proper and accurate surveying of the crops and leaves reducing the human effort. The agricultural farm is surveyed by an infrared camera which will show the colour image displaying the difference between infected or diseased crop and matured crop. The prototype of a light-weight multi-spectral sensor which can be flown on a micro UAV and we discuss the promising results from two field tests which show the excellent potential for assessing plant health in agronomical research. Drones can be involved at the start of the crop cycle. The hyper spectral sensor in drone produce precise 3-D maps for early soil analysis, useful in planning seed planting patterns. After plantation, drone-driven soil analysis provides data for irrigation and nitrogen-level management.The systems shoot pods with seeds and plant nutrients into the soil and it provides the plant all the nutrients necessary to sustain life. Consequently, drones can scan the ground and spray the correct amount of liquid and seed particles modulating distance from the ground and spraying in real time for even coverage. The result is that, increased efficiency with a reduction of in the amount of chemicals penetrating into groundwater. In fact, experts estimate that aerial spraying can be completed up to five times faster with drones than with traditional crop farming. Monitoring challenges are aggravated by increasingly unpredictable weather conditions, which drive risk and field maintenance costs. Finally the SMS regarding the crop details is send via browser to the mobile phone and if the soil moisture is decreased then immediate notification is sent to the browser and motor for water irrigation is automatically switched on. These are the phases of our project and the methodology will be explained below.

KEYWORDS: Agricultural surveillance, Multi-spectral sensor, Agricultural Drone, Soil analysis, SMS, Browser.

I. INTRODUCTION

Constant technological developments of remote sensing techniques utilizing drones (specifically of Unmanned Aerial Vehicles, UAV) are increasing spatial and temporal resolution of data available for land and crop management [1]. This paper presents the design of a smart IOT communication system manager used as a low cost irrigation controller ,sending SMS via browser ,automatic motor operation for irrigation and[2] the drone used for seed sowing ,pesticide spraying and security surveillance .Wireless Sensor Networks (WSNs), Internet of things (IOT) and aerial mapping are nowadays being used very much in agriculture .The field parameters, the index vegetation (estimated using aerial images) and the irrigation events, such as flow level, pressure level or wind speed, are periodically sampled[3].Data is processed in a smart cloud service based on the Drools Guvnor (a Business Rules Manager).We evaluate an algorithm to adjust the UAV route under changes in wind intensity and direction. Hence, we evaluate the impact of the number of communication messages between the UAV and minimize the waste of pesticides.

II. PROPOSED ALGORITHM

FLIGHT PLANNER ALGORITHM

- The input is given by the map name, camera mode which is medium or wide and overlap rate, number of backtracks, obstacles. Grid based decomposition is done and pick up start and end points are specified.
- Wave front algorithm is implemented to find all the path coverages from start point to end point. Compute the path coverages and find the path with minimum cost. Trajectory is generated using cubic spline.

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III. RELATED WORK

3.1. Drone monitoring on crop health

Drones can assist farmers in maximizing their harvest by detecting problems early, and managing the crops by using specific cameras to detect pests and water shortages.[1] To measure the growth of crops over a season, aerial images can be taken at the start of the season, at predetermined intervals during the season and just prior to harvesting to illustrate the growth across the field, as well as highlighting any rows that show signs of stinted growth due to poor irrigation or low initial nitrogen content.

3.2. Selection of Unmanned Aerial Vehicle for Precision Agriculture

Drone is used for the most convenient and efficient form of collecting the necessary data.[2] Specific drone characteristics are recorded/discussed in order to facilitate selecting the right one according to the farmers' heterogeneous requirements regarding the data collection on their crops. Selecting the appropriate drone for the specific needs of farmers is carried out by a multi-criteria decision-making algorithm.

3.3. Improvement of Crop Quality and protection in Agricultural Field

To meet the demand of increased population and food production, the drone is used in agriculture as a viable solution due to their increased accuracy, efficiency and ability to overcome various obstacles that traditional machinery cannot and will improve this industry [3] greatly through accurate measurements, real-time data gathering, and efficient crop management with the concepts of Internet of Things (IoT).Crop protection is the significant method to develop the growth of quality and quantity of food worldwide.[4] Vegetation indexing is performed to identify the infected crops as well as good crops in the agricultural field. Plants Pathology Monitoring and Crop Water Stress Index (CWSI) Monitoring was also performed using drones in precision agriculture for protecting the crops grown.

3.4. Urea spraying and vegetation index in agricultural (UAV) system

Improvement in weight lifting capacity may leads to adding a more function in UAVs. The payload of the Quad-rotor is around from 1 litre to 5 litre water content which adds function of weight lifting in Agricultural fields for Urea spraying operations. [5]The multispectral resolution and temperature sensor cameras are used which however require radiometric and geometric calibrations together with climate correction and imaginary techniques in order to provide green field image products similar to the available from real-time sensors.Agriculture has changed from an art to a precision science using high yielding and disease resistant genetically modified crop. Though GMO crops provide high yields they are very sensitive to other factors like timely irrigation, nutrient constitution of the soil etc. [6] so the efficient method is used to monitor the parameters periodically to improve the crop yield. Agricultural Parameters estimation Agricultural conditions can be assessed directly from the data obtained from UAV aerial surveys. An array of parameters can be obtained from raw data from the UAV depending on the Image capture device (IMD) payload in the UAV. The IMD can either be a visual spectrum camera or Infra-red spectrum camera.

3.5. UAVs Management and crop irrigation in Agriculture Domain

UAV (also called drone) is used in the agriculture domain in a situation where it is necessary to monitor plants or products in a land. [7] Often, farmers need to face many issue such as parasites or sudden climate changes that can severely affect the agricultural products quality. At this purpose, new technologies such as drones equipped with specific sensors, cameras and fertilizers can support farmers to face the threats and, in the specific case, to kill parasites that can destroy plants.To supply sufficient water to avoid crop water stress while minimizing the volume of water used the position functions for irrigation UAVs based on an image of the Crop Water Stress Index (CWSI) of the crop is used [8]. A crop with water stress, even if it is only for a short time, rapidly shows decreased growth and thus loss in production. For this reason indexes such as the Crop Water Stress Index (CWSI) and the Normalized Difference Vegetation Index (NDVI) have been developed in order to monitor crop conditions. This provides a motivation to use the CWSI to develop an irrigation strategy, which can supply the evaporative demand of the plant while minimizing the amount of water used.

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IV.ARCHITECTURE DIAGRAM OF THE PROPOSED MODEL

This detailed architecture diagram of the advanced drone in agriculture described in Fig 3.1 gives the following ways for crop management and data interpretation .The advanced drone in this project is used to spray pesticides and sow seeds in the crop field and the sensors in the IOT Modem captures the images of the infected plants, irrigation level, plant growth and also to get ideas of next crop yield. The data are sent via WSN Technology to the browser and SMS are sent to the remote users via mobile phone.

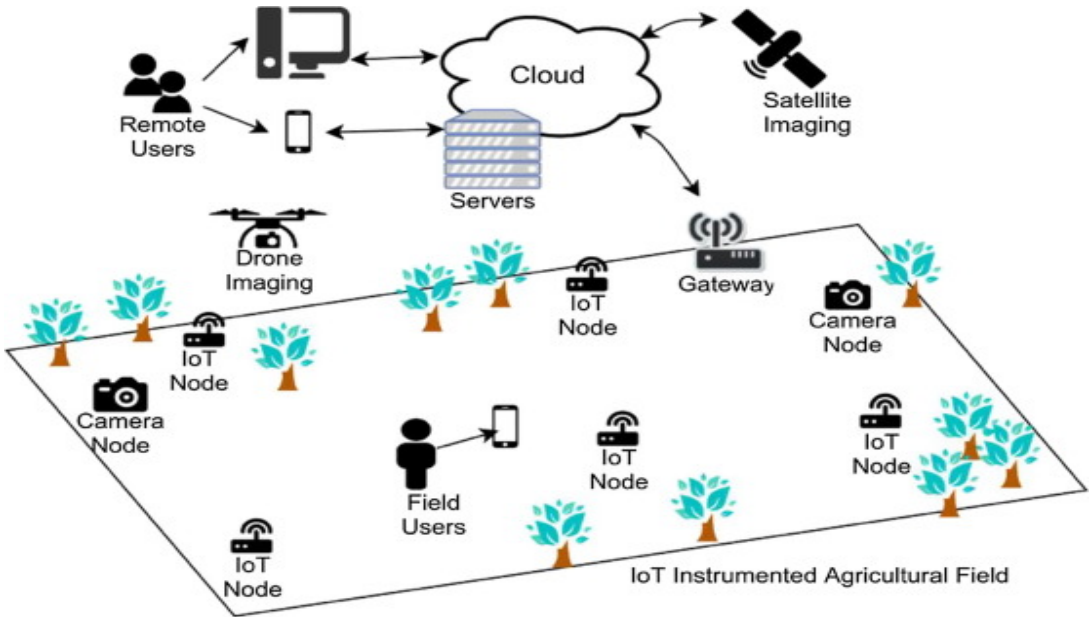

Fig 4.1: View of the agricultural field with drone

V.IOT MODEM IN AGRICULTURE

The IOT Modem consists of 4 sensors namely hyper spectral sensor, optical sensor, thermal sensor and infrared sensor. The hyper spectral sensor performs soil analysis, moisture analysis and identifies whether water is needed or not. It also performs crop yield i.e. what crop can be grown in the next harvest. The infrared sensor is used for pesticide spraying and seed sowing. The thermal sensor is used to monitor the health of the crop by means of chlorophyll pigment classification.

IOT Modem with WIFI module is a WIFI serial transceiver module based on ESP8266 soc. This chip implements a full TCP/IP protocol stack and the very interesting feature is that it also has a great computational power onboard.

The WSN is used to send alert [14] messages to the farmer via Internet through SMS and also alerting through web browser. The specifications are it consists of 32 pin QFN package, Integrated RF switch, Balun 24 dbm PA with a Standby power consumption of < 1.0mw (fig 5.1).

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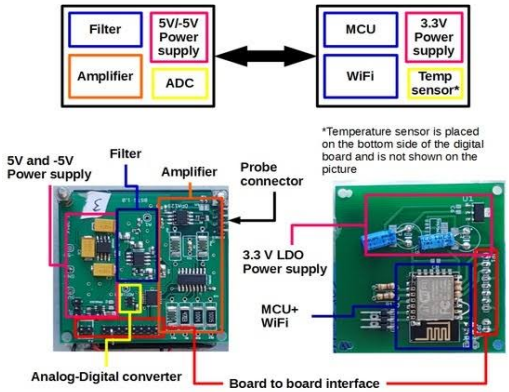

FIG 5.1: DETAILED VIEW OF THE IOT MODEM

VI. IR SENSOR FOR SEED SOWING

The seeds are kept in the tray which is placed on the drone, the IR Sensor first detects whether there are seeds in the field then if there are already seeds the alert message is sent to the browser and to the farmer's mobile that there are enough seeds in the field else the seeds are checked if it is present in tray and then sowed in the field and then the message is updated in the browser [13].

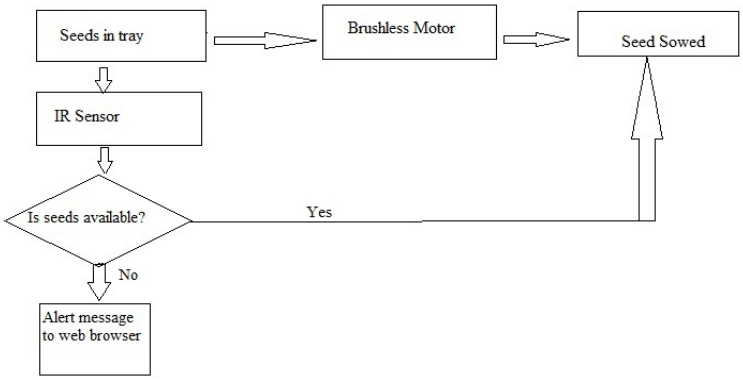

FIG 6.1: WORKFLOW OF THE IR SENSOR FOR SEED SOWING

VII.PESTICIDE SPRAYING

The IR Sensor detects whether the pesticides are sprayed and updates it in the browser[11] and sends sms to famer if not then the pesticides are sprayed via the tube and the message is updated.

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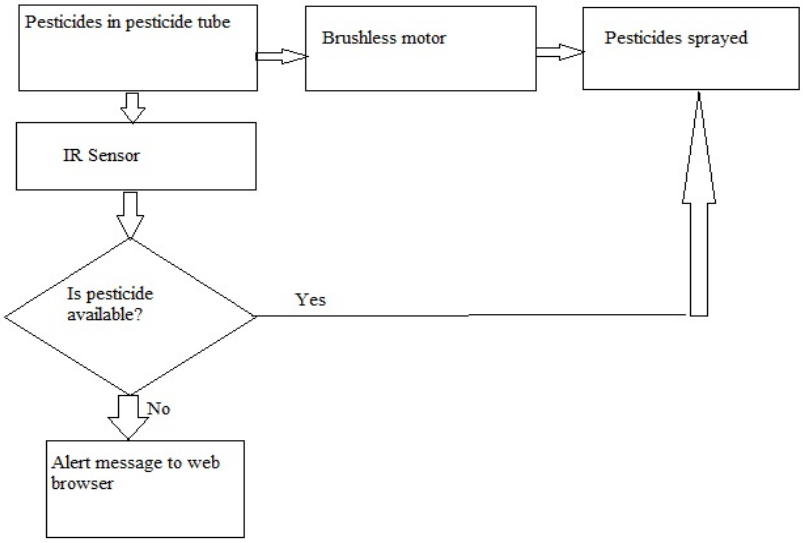

FIG7.1: WORKFLOW DIAGRAM OF THE IR SENSOR IN PESTICIDE SPRAYING

VIII.IRRIGATION

The thermal sensors checks the moisture content of the soil and checks whether the soil is wet or dry, if the soil is wet then no need for irrigation and sends the status of the soil to the web browser but if the soil is dry then the motor is automatically switched on through the web [12] browser and the details of the moisture content of soil is updated.

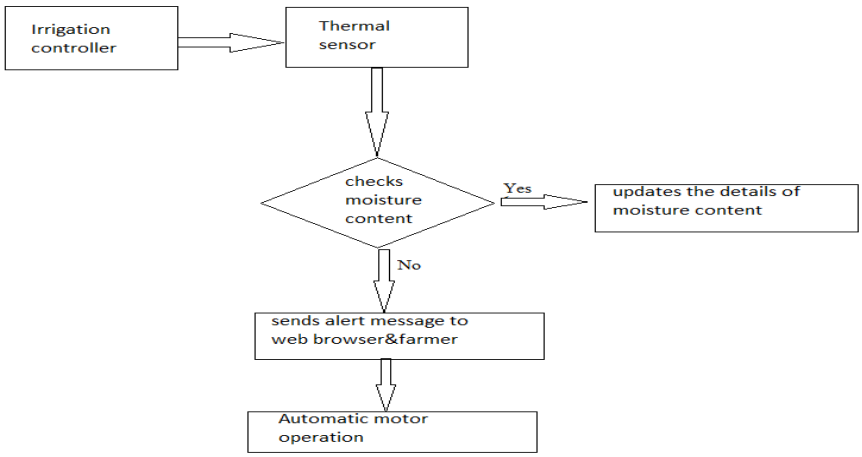

FIG 8.1: OPERATION OF THE THERMAL SENSOR FOR IRRIGATION

IX.CONCLUSION

The Current rural development model paradigms must be altered to produce Better results. Agriculture needs technological interventions to enhance productivity and meet challenges of emerging climate change, food security,

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rural migration and dwindling farm resources in India. Modern trend in Technology development and application is to create synergy between Varieties of different technologies. Wireless network technology is effective and efficient. It is advisable to use wireless technology in agriculture, which can potentially increase productivity, save labour, reduce cost and engender welfare use of fertilizers.The use of drone in the agricultural field along with WSN Technology provides better solution for the farmers. The sensors that are deployed in the IOT Modem is the main benefit of this agricultural drone as the farmers will get intimated through SMS in their mobile and the updating of status of the field in browser. Every project must contribute either in a paradigmatic context orshould find usefulness in society. Consultants, scientists and researchers can use their experience and intuition to judge, whether their efforts are being directed in the right direction or not.

REFERENCES

[1] 1.Dr M Suchithra, 2.Asuwini T, 3.Charumathi M C, 4.Ritu N Lal "Sensor validation for automation farming" Volume 119 , Nov 2018, 14327-14335.
[2] Catalina Albornoz and Luis Felipe Giraldo "Trajectory Design for Efficient Crop Irrigation with a UAV" 978-1-5386-0398-7/17, 2017.
[3] Eobin Alex George, Gaurav Tiwariy, R. N. Yadavy, Edward Petersz and SrishtiSadhana "UAV systems for Parameter Identification in Agriculture" 978-1-4799-1095,March 2013.
[4] M. Zahir Ahmed, Shaik Abdul Muneer, H.Azhar Salam, D. VijayaPushpaMani, "IoT based Smart Automation using Drones for Agricultures",255-2631,Jan 2018.
[5]Mr.S.Meivel, Mr.N.Gandhiraj, Mr.K.Dinakaran, Mr.M.Srinivasan, "Remote sensing for urea spraying", 978-1-4673-9206, August 2016.
[6] Y.A. Pederi, H.S. Cheporniuk," Unmanned Aerial Vehicles and New Technological Methods of Monitoring and Crop Protection in Precision Agriculture", 978-1-4673-6567, March 2015.
[7] ImrePetkovics, Janos Simon, ÁrminPetkovics, Zlatko ovi,"Selection of Unmanned Aerial Vehicle for Precision Agriculture with Multi-criteria Decision Making Algorithm", 978-1-5386-3855, February 2017.
[8] MarthinusReinecke, Tania Prinsloo "The influence of drone monitoring on crop health and harvest size", 978-1-5386-3831, July 2016.
[9] Arnab Kumar Saha, JayeetaSaha, Radhika Ray, Sachet Sircar, Subhojit Dutta, SoummyoPriyoChattopadhyay,HimadriNathSaha," IOT-Based Drone for Improvement of Crop Quality in Agricultural Field", 978-1-5386-4649,June 2018.
[10]Dr.D.Kavitha,"Review of Efficient Monitoring and Surveillance of Intruder Tracking System", October 2018.
[11]Dr.D.Kavitha, "A Survey on Different Software Security Attacks and Risk Analysis Based on Security Threats", Volume 3, April 2015.
[12]Dr.D.Kavitha, "Prevention of CSRF and XSS Security Attacks in Web Based Applications", Volume 5, March 2016.
[13]Dr.D.Kavitha, "Security Threat Management by Software Obfuscation for Privacy in Internet of Medical Thing (IoMT) Application", Volume14, July 2017.
[14]Dr.D.Kavitha, "Review of Botnet Attacks and its detection Mechanism", Volume3, March 2015.