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A REVIEW ON UNMANNED AERIAL VEHICLE USED IN AGRICULTURE

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Abstract - *Drone or UAV is an aerial vehicle which uses aerodynamic forces to lift and can be controlled remotely which can carry the payload. In this paper we will discussed about various technologies used to reduce human efforts in various operations of agriculture. Agricultural drone is an unnamed aerial vehicle used to help optimize agriculture operations, increase production rate of crops and observe the crop growth by using this agricultural drone. With the help of agricultural drone we can gather information and this information help us in improving crops yields and efficiency of farm.*

(Keywords: UAV, aerodynamics, payload)

1. INTRODUCTION

India is agriculture based country & it is main occupation in our country. Around 20.5% agriculture shares in gross domestic product (GDP) of country. Agriculture is not only provides food, but also is the main source of raw materials for industries. Therefore agriculture is known as the backbone of India. Production rate of crops in agriculture is based on various natural parameters such as temperature, humidity, rainfall, climate, soil etc. To increases the production rate and to prevent the crops from insects farmers used pesticides. While spraying of these pesticides has an adverse effect on the health of the farmer. WHO (World Health Organization) conducted survey according to which it is estimated that every year about 3 million workers are affected by use of pesticides and from which 18000 die. This effect of pesticides can be reduced by use of machines such as robots, drone's using new technologies. So to reduced human effort and increase in efficiency of production in this paper we will discuss about the new innovative technology agriculture drone.

In technological terms drone is named as unmanned aircrafts. Drone is basically a flying robot which can be remotely controlled. It works in combination with GPS the flying machine. It can fly autonomously by using software controlled flight plans in their embedded systems. However it can also be used for weather monitoring, fire-fighting, search and rescue, surveillance and traffic monitoring, remote sensing, commercial and motion picture filmmaking. In recent years, the drone has come into attention for a no of commercial uses. Drone has vast future in domestic usage also rather than military usage. The main aim of this thesis is to find an appropriate mathematical model for such a machine and develop a complete control architecture which will help the drone to fly and carries load of pesticides.

1.1 Existing Technology of Agriculture

In existing methodology farmers spray the pesticides on the field by spraying bottles but this method can cause lots of problems regarding health, time, power, cost. And another method is spraying by small aeroplane which is most costly. Agriculture pesticides are common chemical which is used to destroy the unwanted living organism for protection of crops. Improper handling of this process cause severe acute-poisoning.

In this method farmers and also the farm workers suffer the higher risk of exposure to pesticides. That will cause harm to the human through poisoning or injuries. Some pesticides cause toxic effect from mild symptoms, like strong headache, dizziness and some pesticides like the organ phosphorus can cause danger symptoms like coma and possibility in even death or convolution. This pesticide toxicity can cause by either inhaling or if absorbed by the body, also by carrying huge pesticides tanks on the back

can causes heavy back pain to the farmers. Another method is use of large airplanes in field. It is used for spraying pesticides by air from sufficient distance to the crops; they supposed to perform crop dusting and aerial top dressing. Agriculture pilot tried to fly above the crop which is required to treat for reduction in drift. But most of the farm is surrounded by obstacles like electrical poles, trees etc. In case of any accident it may harmful to the pilot. Aerial spraying is harmful for environment because, For aerial spraying huge quantity of pesticides required and that is maybe more than the crops required, so it overflows and when it rains, this will flow to the water body and will contaminated it. So this will result in environmental disaster called biomagnifications.

This will cause pesticides to travel through Food Chain and reach to animal at the top of the food chain. Hence this method is controversial since 1960s also banned in Sweden. Now most of countries limited or Banned this because of European Union prohibited aerial spraying of pesticides with a few highly restricted exception in article 9 of the directive 2019/128/EC. Also small scale farmers can't afford this aircraft.

1.2. Proposed Methodology

For avoiding the issue above mentioned we think a new innovative idea of a quad-copter based pesticide spraying system. It is combination of quad-copter and pesticides tank. The diagrammatic representation of new agricultural technology shown below:

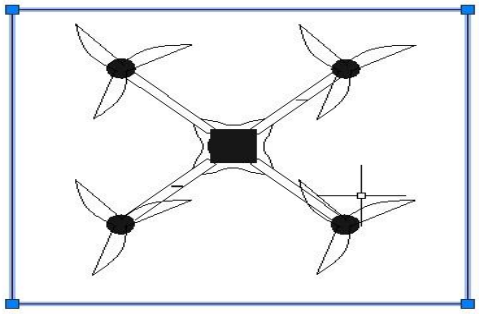

Fig 1. Top view of agriculture drone

It is also called as quad rotor helicopter. It has two configuration in construction, first one is plus (+) configuration, and another one is (X) cross configuration. Both are same but control of this to are different. We are using (X) cross configuration.

The quad copter floats in steady arrangement by turning two propellers in clockwise direction and another two in anticlockwise direction. The ECSs provided specifically with the battery via wiring or Power circulation board. Out of four propeller each one is controlled by their own engine. The flight controller is known as the brain of the quad-copter which guide & control the drone.

2. Structural Design

To design such a dynamic agricultural based drone we need complex electronic equipment. In this implementation we used brushless dc motor, KK2.1.5 Multi rotor flight controller, Electronic speed controller (ESC), digital servo motor & 3300 *mA* Lithium Polymer rechargeable battery.

Sr. No	Equipment	Rating	Quantity
1	Brushless DC Motor	1000KV,450W,60A	4
2	KK2.1.5. Flight Controller	2.4GHz,Sensitivity – 1024	1
3	ESC	60A	1
4	Servomotor	Torque-18kg-cm,4.8V,speed-0.10/60degree	1
5	Lithium Polymer Rechargeable Battery	Capacity-3300mAh,11.1V,3cell	1
6	Propellers	Size-11*4,weight-15gm/pair	8

Table 1. List of Electrical/Electronic Equipment Used

BLDC Motor Transfer Function

i) Mechanical Constant (T_m)

$$\frac{Moment\ of\ intertia\ of\ rotor(j)\times 0.004\times Electrical\ Resistance(r)}{K_e\times K_t}$$

ii) Electrical Constant(T_e)

$$\frac{l\ (inductance)}{0.004R}$$

iii) EMF Constant(K_e)

$$Kt \times 0.0605$$

Where Kt – Torque Constant

$$Torque = \frac{P \times 9.554}{n(RPM)}$$

Torque constant= $\frac{Torque}{Current}$

BLDC Transfer Function = $\frac{\frac{1}{K_e}}{T_m\ T_e\ \ \rho^2 + T_m\,\rho + 1}$

Terminology

Quad-copter – Quad copter is a term used to refer a drone which is controlled by four rotors

Mechanics

Frame – frame known as the skeleton of the aircraft and holds all the parts of drone together.

Propulsion

Blades – propeller blades are known as the aerodynamic surface which generates lift . If we increase the number of blades then the amount of work will decrease.

ESC – Electronic speed controller is used for control and dynamic braking.

LiPO – LiPO is lithium polymer battery is a rechargeable battery of lithium ion technology using a polymer electrolyte in place of liquid electrolyte.

Motor – Motor used have a huge impact on the payload which our UAV can support, as well as flight time.

Propeller – For multi motor aircraft propeller used in RC airplanes are adapted.

Thrust – Thrust is known as the force which a specific motor and propeller can provide . Thrust is measured in kilograms (Kg) or pounds (Lbs).

Control

Flight controller- Flight controller is known as the brain of aircraft. It is a circuit board with a range of sensors that can detect movement of drone.

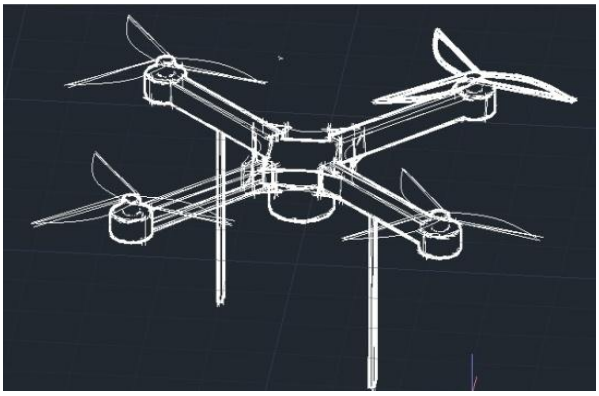

Fig 2. Agriculture Drone

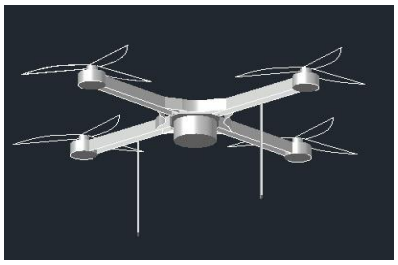

Fig 3. Bottom view of drone

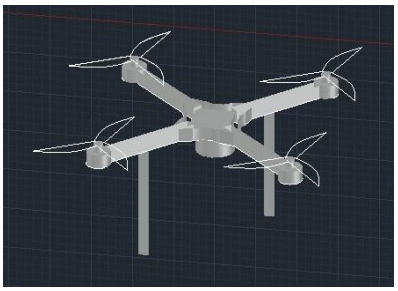

Fig 4. Isometric view of drone

Advantage

Agricultural drone helps to increase crops productivity, permitting for improved agricultural adaptation to the effects of climatic changes. This drone also helps to reduce pollution. Using agricultural drone we can save labor cost as well as human efforts are reduced. It prevents the farmer from harmful effects which arise from spraying pesticides.

3. CONCLUSION

Modern farming industry is at a turning point due to development of advanced farm management techniques. Using agricultural drone help to improve the yield crops. Using drone helps farmers to transform the agriculture industry. Implementation of UAV helps to improve soil and plant knowledge, efficiency of input, economical and environmental sustainability.

Future Scope

Successful farming drones known as unmanned aerial vehicle (UAVs) were 1st received with hesitation in the agriculture industry. Future of agriculture drones looks promising by 2026. Drones are not only used for spraying pesticides. It can be used for multiple purposes in agriculture as well as other purposes. Using drone increases overall efficiency. In agriculture drones can be used from mapping to spraying. Drones are mostly used in precision agriculture (PA), satellite farming or site specific crop management (SSCM). Drones can also keep track of livestock, surveying fences and monitoring for plant pathogens, can take pictures with its camera. Drones can be used in agriculture operations such as

1. Estimating soil conditions
2. Planting future crops
3. Fighting infections and pests
4. Agricultural spraying
5. Crop surveillance
6. Live stock monitoring

REFERENCES

1. International Journal of advanced research in computer science and software engineering-Volume-5 Issue 12 Dec 2015- ISSN:2277128X ,Prof Swati Kale , Swati V Khadangle , Sayli S. Narve , Purva V Gangal , Agriculture drone for spraying Fertilizer and pesticides

2. International Academic Research Journal of Engineering Science Volume-1 Issue 1 Feb 2016, ISSN No:2414-6242(Print), Quad-Copter UAV Based Fertilizer and Pesticide Spraying System.

3. O. J. Oludayo , " Pid Control Of Brushless Dc Motor And Robot Trajectory Planning And Simulation With Matlab®/Simulink®," Aalto University, Finland, 2009.