



AUTONOMOUS FERTILIZER DISPENSER FOR AGRICULTURAL APPLICATIONS

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ABSTRACT:

There are too many technologies involved in today's Agriculture, out of which spraying pesticides using drones is one of the emerging technologies. Manual pesticide spraying causes many harmful side effects to the personnel involved in the spraying process. The Exposure effects can range from mild skin irritation to birth defects, tumors, genetic changes, blood and nerve disorders, endocrine disruption, coma or death. The WHO (World Health Organization) estimated as one million cases of ill affected, when spraying the pesticides in the crop field manually. This paved the way to design a drone mounted with spraying mechanism having an octocopter configuration frame ,suitable landing frame, 8 Brushless Direct Current (BLDC) motors with suitable propellers to produce required thrust about 38.2 KG(at 100% RPM) and suitable LithiumPolymer (LI-PO) battery of current capacity 22000 mAh and 22.2 V to meet necessary current and voltage requirements. A First-Person View (FPV) camera and transmitter can also be fixed in the drone for monitoring the spraying process and also for checking pest attacks on plants. This pesticide spraying drone reduces the time, number of labor and cost of pesticide application. This type of drone can also be used to spray disinfectant liquids over buildings, water bodies and in highly populated areas by changing the flow discharge of the pump.

Key Words: DRONE, AGRICULTURE, PAYLOAD, SENSORS, PUMP, SPRAY.

INTRODUCTION:

The Indian Agricultural sector is the most important sector as it amounts to a staggering 18% of India's Gross Domestic Product (GDP) and also provides employment to 50% of the national human workforce. Our country is dependent on agriculture so much, has yet to tap into the real potential of agriculture, because of improper methods of monitoring crops and the irrigation patterns and the pesticides required to be applied. In India, there are over 35 drone start-ups that are working to raise the technological standards and reduce the prices of agricultural drones. This project aims to develop Unmanned Aerial Vehicle (UAV) for overcoming this problem and also spray large amounts of pesticides within smaller interval of time using Octocopter. The foremost activity of mankind is



Agriculture. In Simple words, it means flourishing plants & systematic way. 50% of global population is involved in agricultural activity. Figure 1: Cultivation in Ancient Egypt Developed severally by population that was terrestrially distant, the process 1st came into sight systematically in west Asia with majority of house-trained Neolithic plants and placental currently are derived at Turkey by polymer studies. Primary cereals of Turkish wheat are found at Abu Herrera dated to thirteen, 500 BP. only anomaly to ined in 2 places in Israel, and East of the Zagros Mountains in Asian country. Assumed founder of crops are : 1st Triticum dicocum and einkorn wheat, then hulled barley, peas, lentils, bitter legume, chick peas and flax. Bitter legume and lentils beside almonds and pistachios seem in Franchthi Cave Greece 1011 at the same time, about 9,000 BC, They are not indigenous to Balkan Country & seem 2000 years before Home ISSN (Online) 2581- 9429, Communication and Technology (IJARSCT)190.

EXISTING SYSTEM:

BACK PACK SPRAYER:

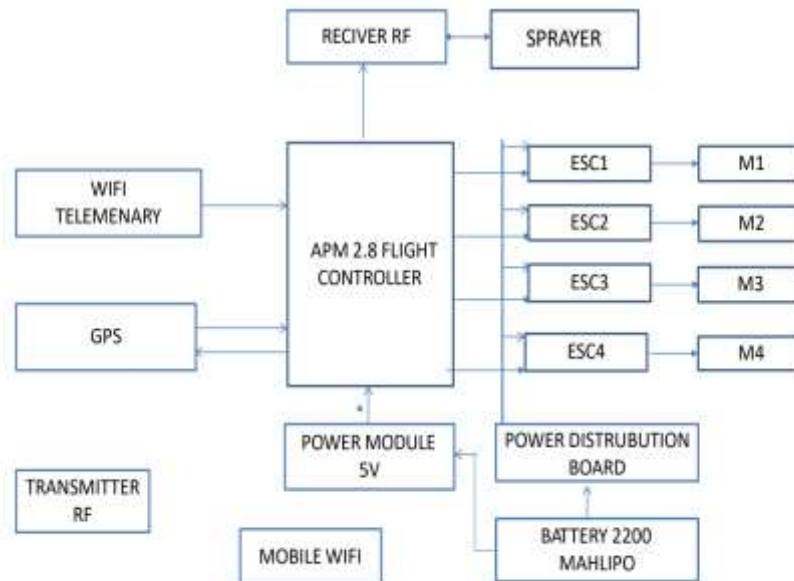
This consists of a tank, a pump, a lance (for single nozzles) or boom (for multiple nozzles). The tanks contain a mixture of water and chemical which will be sprayed in the form of droplets. In this type of spraying, the labor has to carry the complete weight of the fertilizer tank which causes severe back pain and other physical problems to labor.

PROPOSED SYSTEM:

We chose to autonomous fertilizer dispenser for agricultural applications, instead of operating of manually. Because this can save time and field monitoring can become easy. For this purpose, we use APM 2.8 flight controller 2.4 MHz transmitter and receiver and ESC. In this Drone can record the plant condition while spraying which will be useful in identifying the crop diseases and plant monitoring.



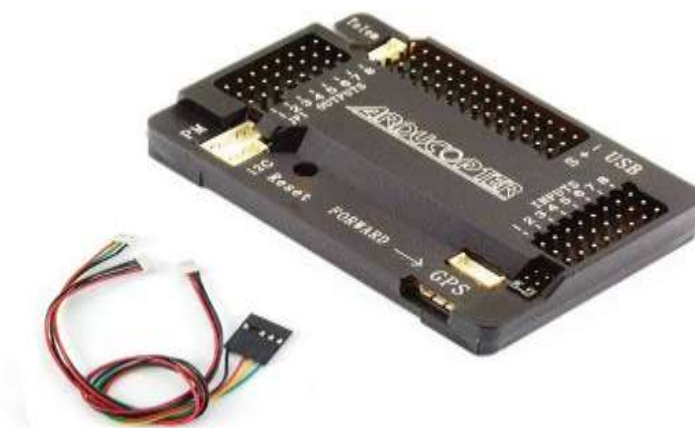
BLOCK DIAGRAM:



HARDWARE COMPONENTS:

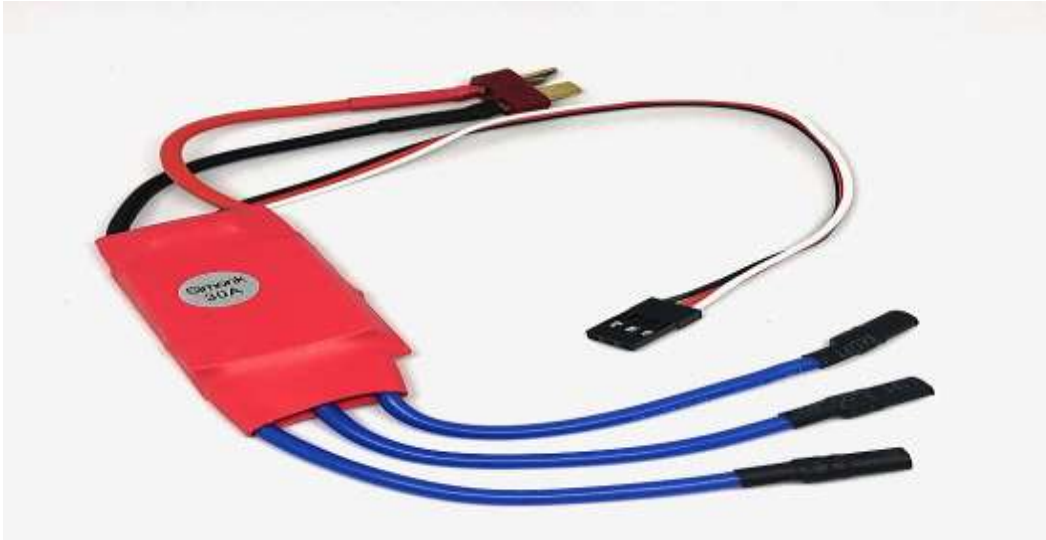
APM 2.8 FLIGHT CONTROLLER

APM 2.8 Multicopter Flight Controller 2.5 2.6 Upgraded Built-in Compass for FPV RC Drone Aircraft is the new APM 2.8 flight controller. The sensors are exactly the same as the APM 2.6 flight controller, however, this has the option to use the built-in compass, or external compass via a jumper. This makes the APM 2.8 ideal for use with multi-copters and rovers. The APM 2.8 Multicopter Flight Controller is a complete open source autopilot system and the bestselling technology that won the prestigious Outback Challenge UAV competition. It allows the user to turn any fixed, rotary wing or multirotor vehicle (even cars and boats) into a fully autonomous vehicle; capable of performing programmed GPS missions with waypoints.



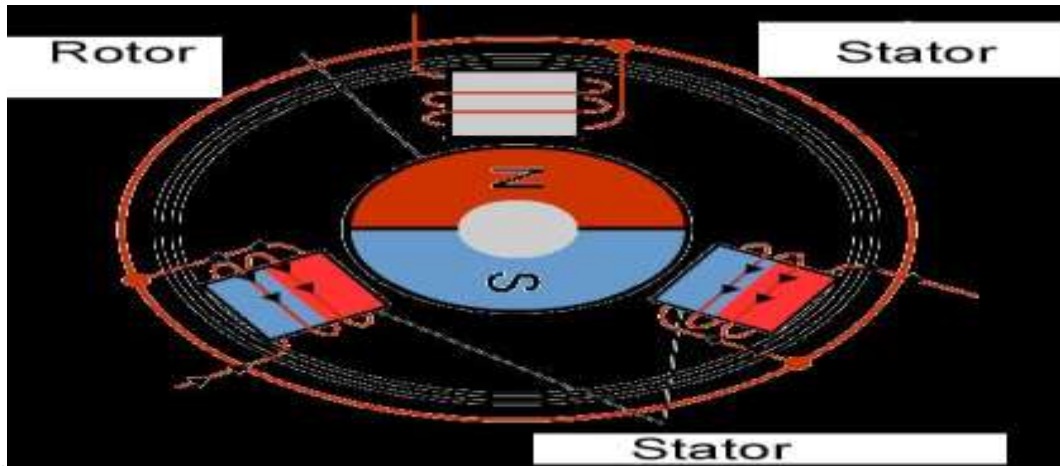
ELECTRONIC SPEED CONTROL(ESC):

An electronic speed control or ESC is an electronic circuit with the purpose to vary an electric motor's speed, its direction and possibly also to act as a dynamic brake[30-35]. ESCs are often used on electrically powered radio controlled models, with the variety most often used for brushless motors essentially providing an electronically generated three-phase electric power low voltage source of energy for the motor.



BRUSHLESS MOTORS:

Brushless DC motors (BLDC) have been a much focused area for numerous motor manufacturers as these motors are increasingly the preferred choice in many applications, especially in the field of motor control technology. BLDC motors are superior to brushed DC motors in many ways, such as ability to operate at high speeds, high efficiency, and better heat dissipation. They are an indispensable part of modern drive technology, most commonly employed for actuating drives, machine tools, electric propulsion, robotics, computer peripherals and also for electrical power generation. With the development of sensorless technology besides digital control, these motors become so effective in terms of total system cost, size and reliability.



PROPELLERS:

Propellers are devices that transform rotary motion into linear thrust. Drone propellers provide lift for the aircraft by spinning and creating an airflow, which results in a pressure difference between the top and bottom surfaces of the propeller. This accelerates a mass of air in one direction, providing lift which counteracts the force of gravity.



LIPO BATTERY (11.1-2200Mah):

An electric battery is a device consisting of two or more electrochemical cells that convert stored chemical energy into electrical energy. Each cell has a positive terminal, or cathode, and a negative terminal, or anode. The terminal marked positive is at a higher electrical potential energy than is the terminal marked negative. The terminal marked positive is the source of electrons that when connected to an external circuit will flow and deliver energy to an external device. When a battery is connected to an external circuit, Electrolytes are able to move as ions within, allowing the chemical reactions to be completed at the separate terminals and so deliver energy to the external circuit. It is the movement of those ions within the battery which allows current to flow out of the battery to perform work. Although the term battery technically means a device with multiple cells, single cells are also popularly called batteries.



Power Distribution Board:

A distribution board (also known as panel board or breaker panel) is a component of an electricity supply system which divides an electrical power feed into subsidiary circuits, while providing a protective fuse or circuit breaker for each circuit in a common enclosure. Normally, a main switch, and in recent boards, one or more residual-current devices (RCD) or residual current breakers



GLOBAL POSITIONING SYSTEM (GPS):

GPS drones are equipped with a GPS module that allows them to know their location relative to a network of orbiting satellites. Connecting to signals from these satellites allows the drone to perform functions such as position hold, autonomous flight, return to home, and waypoint navigation. Having GPS on your first drone may not be essential, especially if you're looking for a very basic drone that you don't mind crashing a time or two (or more!) as you're learning. But you might find that having GPS on your drone is more affordable than you think. And the advantages that GPS offer in terms of ease of flight and more advanced smart features more than make up for the slight increase in cost.



2.4GHZ RC TRANSMITTER AND RECIVER:

With 2.4GHz effectively 40 channels are available and the sets automatically set themselves to an unused frequency when switched on. Operation is constantly self monitored and the set will move to an unused frequency if any interference is detected

Because 2.4G RC systems work on higher frequency short wave length, the transmitter antenna is only about 15cm long and flexible - avoiding bends and breakages that can occur with traditional 35Mhz telescopic aerials! The receiver antenna is much shorter too - allowing for much neater installation of the radio gear in the helicopter





RESULTS





CONCLUSION:

In this paper we have described a design of a drone mounted spraying mechanism for Agricultural purpose and for spraying disinfectants. This method of spraying pesticides on Agricultural fields reduces the number of labours, time, cost and the risk involved to the personnel involved in spraying the liquids. This drone can also be used in spraying disinfectant liquids over buildings, water bodies and highly populated areas.

FUTURE SCOPE:

Under the current COVID19 Pandemic situation, it can be used to sanitize large hotspots areas without actually going there in person. Manual control can be changed into autonomous control with GPS technology and auto return home option. With image processing techniques, the drone can be involved in surveillance to determine the pest attack on the plants, condition of ripening fruit.

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