AN UNMANNED AERIAL VEHICLE

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Abstract — In an effort to increase crop production, precision agriculture has seen far too many breakthroughs recently. Especially in developing countries like India, agriculture provides a livelihood for over 70% of the rural population. The diseases seriously damage the agricultural grounds. Pests and weeds propagate these diseases, reducing agricultural productivity. Pesticides and fertilisers are used to eliminate insects and other pests to increase the quality of the crop. The WHO (World Health Organisation) estimates that one million cases of unfavourable effects happened when pesticides were manually applied to agricultural areas. Unmanned aerial vehicles (UAVs), which are aircraft that spray pesticides to prevent health issues for humans, were developed as a result.

I. INTRODUCTION

In India, more than 60% of all occupations are in agriculture. It serves as the Indian economy's cornerstone. Increasing agriculture's production and efficiency requires making sure that farmers can cultivate their land safely. The several operations, such as applying fertiliser and pesticides, are necessary. Although farmers are now forced to apply pesticides, the habit still has a detrimental impact on them. Farmers employ a number of safety measures, particularly while spraying urea, include donning the appropriate gear, masks, and gloves. Any negative effects on the farmers will be avoided. Additionally, it is impractical to completely eliminate pesticides because the intended result must be attained. This study employs pesticides to spray over the study area in an effort to lessen the harmful effects of pesticides on people.

A.Maintaining the Integrity of the Specifications

Both pesticides and fertilisers are sprayed using the global pipeline, however fertiliser is not yet sprayed in this way; pesticide spray is now carried out using a pressure pump. The quadcopter may be remotely controlled and guided autonomously over great distances using GPS. The quadcopter's RF transmitter and motors are managed by automatic control and paid upload.

II. TYPES OF DRONEA.FIXED WING DRONES:

Fixed-wing drones feature a stiff wing (a non-moving wing), the fuselage (the main body of the aircraft), and tails that are driven by a motor and propeller. They gain from being able to fly quicker for longer periods of time, enabling them to cover a wide variety of potential scenarios. These drones have the disadvantage of being unable to hover and need a runway or launcher in order to take off and land in a variety of environments (such as a jungle, desert, mountain, or ship).

B. MILITARY HELICOPTERS:

These are known as rotatory wing drones because they use propeller- or rotary blade-based propulsion systems. These drones have remarkable manoeuvrability and can fly in all directions, both horizontally and vertically, unlike fixed-wing models. They can even hover. Due to their qualities, they are the best drones for checking hard-to-reach areas (pipelines, bridges). They receive a lift akin to that of helicopters thanks to the rotor blades' continuous revolution. But they also have the disadvantages of slow speed and little range.

C.DRONES WITH TETHERED SYSTEMS:

Tethered drone systems, which rely on a robust physical connection in the form of a flexible wire or cable, are used to supply power and communication to an unmanned aerial vehicle (UAV). Because fixed-wing drones can't hover, UAV tethered systems utilise quadcopters or other multirotor drones in addition to aerostats. They are used when a smaller operating area is needed and a longer flight time is needed than a free-flying drone can provide.

III DRONE CLASSIFICATION:

1. Exceptionally small drones: These devices can range in size from the size of a giant beetle to a 50 cm long object. The two most common drone types in this category are mini and nano/micro drones. These tiny drone They are commonly employed for biological welfare and espionage because of their tiny size and light weight..

2. Mini drones, sometimes referred to as mini drones, have a maximum dimension of 2 metres, making them somewhat larger than micro drones. While many designs in this category are based on the fixed wing type, few of them can include rotary wings. Due of their small stature, they lack strength.

3. Drones that fall into the "medium" category are lighter than light aircraft yet too large to be operated by one person. These drones can carry up to 200 kg of weight and have a typical flying duration of 5 to 10 minutes. One of the most popular designs in this category is the UK watch keeper.

4. Large drones: Large drones are often used for military operations and are roughly the same size as an aeroplane. These drones are often employed to photograph places that conventional planes cannot reach. They perform the role of the main surveillance-related device. Users may further divide them into other groups based on their flying ability and range.

DRONE RANGE	FLIGHT DISTANCE	FLIGHT TIME	USE
Very-close RangeDrones	5 km	1 Hour	• Recreation
Close-range drones	up to 50 km	1-6 Hours	• Military surveillance • Aerial photography
Short-range drones	up to 150 km	8-12 Hours	• Large-scale surveillance • Mapping and surveying • Utility inspection
Mid-range drones	644 km	24 Hours	• Military combat and surveillance
Long-range drones	More than 644 km	More than 24 hours	• Military surveillance and espionage • Weather tracking • Geographic mapping

IV SYSTEM DESIGN

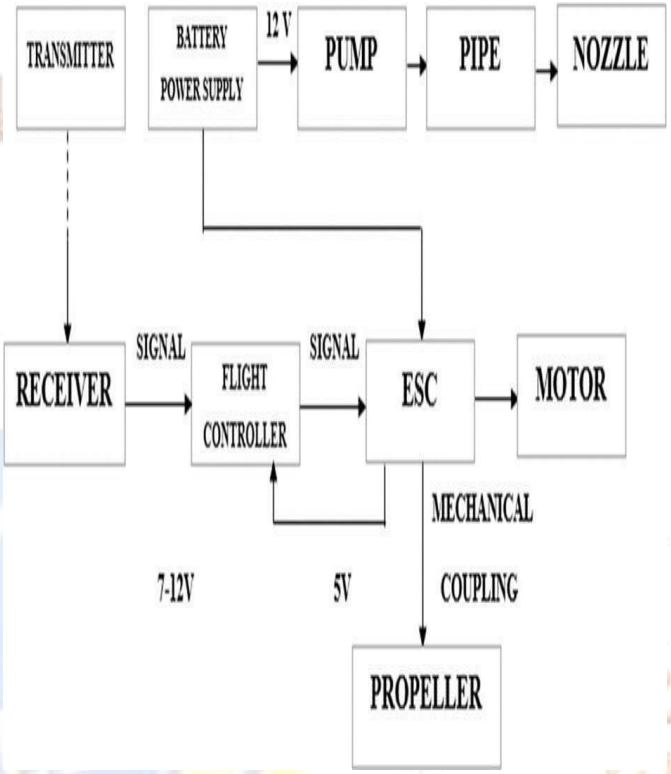
EXISTING SYSTEM:

Engineering automation is a crucial component that is now essential in all fields. As of right now, there is a labour deficit in the agricultural sector. The 'Automated Drone' under consideration is intended to make it possible to spray fertiliser. It offers several features and advantages over currently existing drones that will decrease work and time and boost farming productivity. The 'Automated Drone' will utilise GPS technology and be controlled by sensors. The primary benefit of this "Automated Drone" is that it operates without the need for manual control or user interfaces. The 'Automated Drone' is a useful device. which can be used in all agricultural farming to lessen the farmers' workload and to be economical.

PROPOSED METHOD:

In the method we've suggested, a programmed controller that receives inputs from the GPS module and the radio

In order for the drone to take off, the transmitter then outputs to the flight control system. The drone will autonomously fly to the selected landing site when its task is complete. The main advantages of this agricultural drone are lower personnel expenses, increased productivity, speed, and even spraying. The principal board of the UAV, referred to as the flight controller, is in charge of actual flying and contains the most modern firmware. The flight controller oversees a variety of tasks simultaneously during a flight or UAV. Integrated within the gadget is a microprocessor that communicates with the four brushless motors. the BLDC motor's rotors are



V HARDWARE COMPONENTS

A. Flight Controller (KK2.1):

The flight controller is a drone's "brain." a small box with sophisticated electronics and software that controls and governs all drone activities. Like the size and complexity of different animals' brains, flight controllers are likewise variable in size.

The next phase of the rotor rotation's development has begun! The sensors, memory, and header pins of the KK2.1 Multi-rotor LCD Flight Control Board With 6050MPU and Atmel 644PA have all been improved, enabling it to pack a powerful punch..

The KK2.1.5 is the next major advancement of the KK flight control boards used in the first generation. The device is simple to install and set up. owing to the software and LCD panel that are already there.

B. Perception (sensing):

The flight controller is equipped with a number of sensors. These sensors provide information to the flight controller about the aircraft, such as its height, orientation, and speed. an inertial measurement unit (IMU) for sensing angular speed and acceleration, a barometer for height measurement, and

using distance sensors to identify obstacles. Like how people see things, the drone filters a lot of this data and combines some of it. More accurate and effective information is produced as a consequence. Advanced flight controls are able to detect discrepancies more precisely and faster.

C. Controlling:

Naturally, a flight controller not only perceives what is happening but also directs the drone's motion. The drone can spin and accelerate by creating speed differences between each of its four motors. The flight controller uses the data gathered by the sensors to compute the desired speed for each of the four motors. The flight controller sends this desired speed to the electronic speed controllers (ESCs), which translate it into a signal that the motors can understand.

D. Communicating:

A flight controller's ability to communicate is essential. One of the responsibilities of the sensor is to transmit data, which must be successfully translated into words that a pilot can understand. It is clear to convey such information since the battery level will determine whether a pilot wants to continue flying or land and recharge..

With the advent of auto-pilot software for drones, the need for communication between a flight controller and other computer systems regarding a drone's flight destination and route has risen. Although cellular solutions are also in use, wi-fi and radio frequencies are currently the most often employed for communication.

E.FLYSKY CT6B 2.4GHZ 6CH TRANSMITTER WITH R6B RECEIVER, FS:

The 2.4 GHz 6 Channel Transmitter and Receiver(FS-R6B) Remote is a popular 6 Channel Radio CT6B produced by FlySky. The CT6B FLYSKY 2.4GHZ 6CH TRANSMITTER is a basic 2.4 GHz radio system that provides a receiver with 6 channels as well as the reliability of 2.4 GHz signal technology. The CT6B FLYSKY 2.4GHZ 6CH TRANSMITTER radio is an affordable, entry-level 6 channel transmitter that is ideal for quadcopters and multicopters that require 6 channel operation.

With two retract switches and conveniently located proportional flap knobs for channels 5 and 6, the FlySky FS CT6B radio is incredibly portable and lightweight. It may be powered by either eight AA batteries or a 12 volt power source. It has a training port to help new pilots master their craft.

The FlySky FS CT6B kit includes the FS-R6B receiver, one of the best in its class at a relatively affordable price. For the same, we received a lot of positive and encouraging feedback from our hobbyist customers. By connecting it to a computer, you can configure it. On a computer, configure your radio using the T6 config programme.the transmitter and

descriptions.

Model	KK2.1.5
Input Voltage (V)	4.8V-6.0V
Firmware	Pre-installed firmware
Sensors	6050 MPU
Auto-level	Yes
Processor	Atmel 644PA
AVR interface	Standard 6 pin
Micro-SD Card Slot	No
Signal from Receiver	1520us (5 channels)
Signal to ESC	1520us
Length (mm)	50.5
Width (mm)	50.5
Height (mm)	12
Weight (gm)	21

F.Receiver Test:

To set the Roll, Pitch, and Yaw values to zero, use the transmitter trims.

Make that the throttle is set to 0 at low throttle and reads "Idle"; at maximum throttle, it should read "Full" and be greater than 90. For low and high throttle, respectively, adjust the transmitter's throttle trim.

At maximum stick travel, Roll, Pitch, and Yaw should all read between -100 and -90 and 90 and 100, respectively. To do this, adjust the transmitter's end points. No more than +/- 110.

The Roll, Pitch, and Yaw stick instructions should be shown as Left, Right, Forward, and Back, respectively. If required, reverse the throws in your transmitter.same, we received a lot of encouraging and motivating responses from PC users. To configure your radio, use a computer and the T6 config application.the transmitter and receiver's pins

descriptions.At full right yaw and throttle (throttle 0), it should say "Arm." When at maximum left yaw and minimal throttle (0), it should state "Disarm." As long as there are no ERRORS shown on the SAFE screen, your multicopter should arm and disarm..

If "No signal" is shown, confirm that the receiver is plugged in. You may check that your receiver works with your transmitter by connecting a servo to a spare receiver output...

Check the Auxiliary channel input and change your transmitter's channel if necessary...

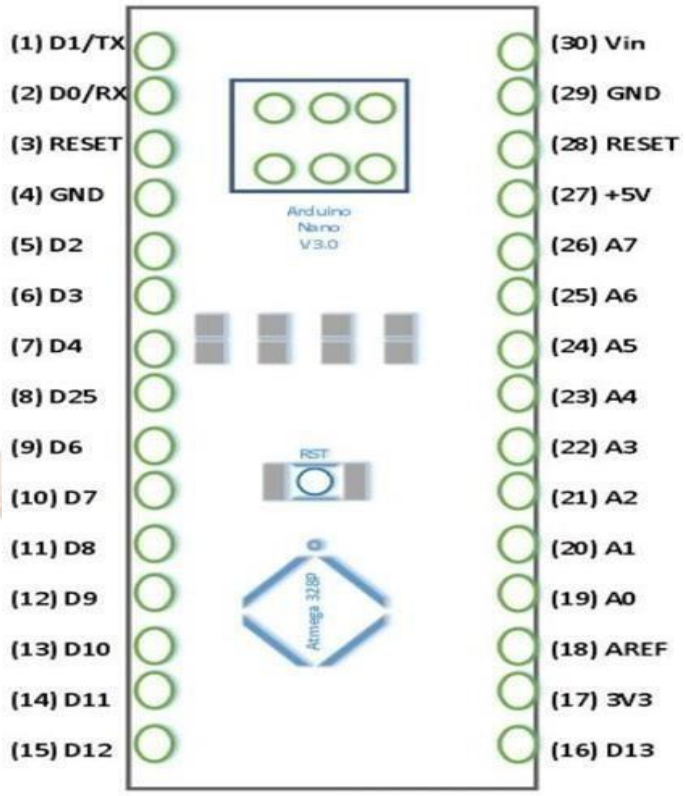
model kind	Wireless digital radio receiver
Length of Antenna	Receptacle: 26 mm
Type of Modulation	GFSK
Sensitivity	1024
Type Code	Digital
Band-Range	2.4055 – 2.475GHz
Bandwidth	500 KHz
DSC Port	Yes (3.5mm:output:PPM)
Charging Port	Yes
Default Operating Mode	Mode 2 (Left-Hand Throttle)
Color	Black
Low Voltage Warning	Yes(at less than 9V)
No. of Channels	6
Operating Voltage	12V DC (1.5AA x 8 Battery)
RF Power	Less Than 20 dbm
Dimensions (mm) LxWxH	189 x 97 x 295
Weight (gm)	511

G.ARDUINO NANO:

The Arduino Nano, produced by Arduino.cc, is one type of microcontroller board. It may be built using an Atmega328 microprocessor. The Arduino UNO also makes use of this chip. It is a small, flexible board with a wide range of applications. Other Arduino boards include the Arduino Mega, Arduino Pro Mini, Arduino UNO, Arduino YUN, Arduino Lilypad, Arduino Leonardo, and Arduino Due. Additional development boards include the Raspberry Pi, Intel Edison, MSP430 Launchpad, AVR Development Board, PIC Development Board, and ESP32 board.

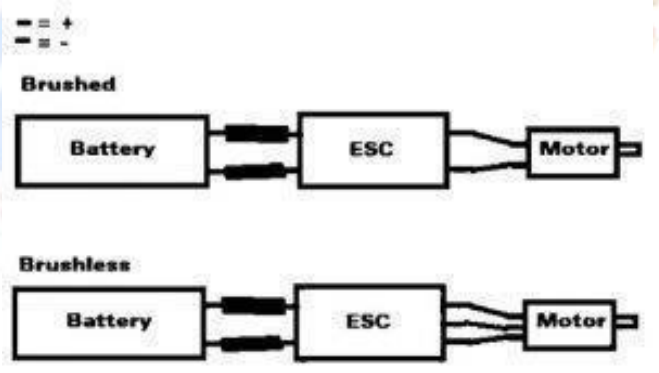
In many respects and characteristics, this board is comparable to an Arduino Duemilanove board. But this Nano board's packaging is special. It does not have a DC connector, thus a small USB port can be used to deliver power instead.

the VCC and GND pins are directly linked. You may supply this board with 6 to 20 volts using a little USB port on it.pinout for a nano-Arduino



H. ESC (ELECTRONIC SPEED CONTROLLER):

Electronic speed control, sometimes known as ESC, is a form of electronic circuit used to change the speed, direction, and dynamic braking capabilities of an electric motor. These are frequently used in electrically powered radio-controlled models, with brushless motors being the most popular kind since they provide the motor with a low voltage, three-phase energy source that is provided electronically. In most toy-grade R/C vehicles, an ESC is included into the receiver itself, but it can also be a separate device that connects to the throttle receiver control channel. In their entry-level cars, containers, or planes that link merely hobbyist electronics, several R/C manufacturers utilise sophisticated electronics that integrate the two on a single circuit board.



I. BLDC Motor:

Quadcopters and multirotor aircraft are the only uses for this A2212 brushless outrunner motor. A 1000 kV motor powers it. It performs really well,

Extremely powerful and beautifully effective. For medium-sized quadcopters with propellers between 8 and 10 inches in diameter, these motors are perfect. When coupled with our 30A ESC, high efficiency 10" propellers, and 3S LiPo battery, these motors can produce up to 800gms. With our propellers and four of these motors, a quadcopter can produce 3.2 kg of force. Use this to build sturdy, reliable quadcopters.

J.Li-Po Battery:

Lithium is one of the electrodes of a rechargeable battery known as a lithium-polymer battery (LiPo), and solid polymer serves as the electrolyte in true LiPo batteries..

True LiPo batteries are not yet economically viable on a large scale. LiPo batteries are thinner, more flexible, and lighter in commercial applications.LiPo batteries are a good fit for thin smartphones, tablets, and wearables due to their characteristics.

Due to their greater discharge characteristics, LiIon (lithium ion) batteries are making a comeback, but LiPo (lithium polymer) batteries made a splash in radio-controlled hobbies and are still an option.

Despite ordinary pouch-type LiIon batteries being available, they still require an additional cover to prevent expansion that might compromise performance and safety...

Cell Configuration:

A battery is constructed by joining many rectangular cells together. A cell, which may be compared to a standalone battery, has a nominal voltage of 3.7V. By connecting more batteries in series, the voltage may be increased to 7.4V for a two-cell battery, 14.8V for a four-cell battery, and so on. To increase capacity, more batteries can be connected in parallel. Numbers like 3S2P, which designates a battery having 4 series-connected cells and 2 parallel-connected cell sets, for a total of 6 distinct cells, are widely used. As a result, the number of cells affects the battery's voltage. with a bigger

voltage of a battery

The nominal voltage of a LiPo cell is 3.7V, and a lipo cell is one cell multiplied by one volt, or 1S. The 14.8V battery shown above is made up of four series-connected cells, therefore the voltage is summed up. This explains why a battery pack may occasionally be described as having a "4S" design, which stands for four cells in series. The voltage of a four-cell (4S) pack is 14.8 volts, that of a three-cell (3S) pack is 11.1 volts, and so on..

The voltage of a Lipo battery pack will mostly determine how fast your car will go. Voltage has a direct impact on the RPM of electric motors (brushless motors are rated by kV, which stands for "RPM per Volt"). A brushless motor with a 3,500kV rating will thus revolve at a speed of 3,500 RPM for every volt applied to it. On a 2S LiPo battery, that motor will spin at about 25,900 RPM. On a 3S, it can spin at a mind-blowing 38,850 RPM. Consequently, the more voltage you have, the faster you will go...

You must comprehend your RC model's motor in order to select the proper lipo battery. The motor is impacted by voltage, and the motor impacts speed. Here is the equation: The power (P) of the motor increases with voltage.

$$P=V*I$$

K.Propellor:

The propellers are used to raise the UAV. The two characteristics of the propellers are their diameter and pitch. The pitch of the propellers is the amount of space covered during one spin. Lower pitch propellers can carry heavier weights because they provide more torque and use less power from the motors to move big loads. The motors will use less power from the battery as a result, increasing the UAV's flying duration. Although employing propellers with a greater pitch value would provide less thrust, which would cause turbulence.

How effectively a UAV can fly depends on how much air contacts its propeller surface. Larger diameter propellers will make more air contact than smaller diameter propellers, increasing their effectiveness. Propellers are the names for the motors on either side of a multicopter.

J.Water Pump:

As its name indicates, water pumps move water. Whether in a vehicle, at a company, in the house, or in a well, customers can probably find a water pump to fit their vehicle or to help them extract water from the earth in a self-dug well to be used in pressure tanks nearby. The water flow through a vehicle's cooling system is controlled by vehicle water pumps; when a seal on one of these pumps fails, the entire pump must be replaced..

Water pump motor

SOFTWARE REQUIREMENTS:

- Arduino IDE
- Embedded C

A. Arduino IDE:

Arduino is an open-source electronics platform with straightforward hardware and software. An Arduino board may be used to take inputs such as light on a sensor, a finger on a button, or a tweet, and then trigger a motor, switch on an LED, or post anything online. You may direct a board to do anything by sending the board's CPU a set of instructions. You do this by utilising the Processing-based Arduino Software (IDE) and the Wiring-based Arduino Programming Language.

Numerous projects throughout the years, from basic home goods to complex scientific apparatus, have employed Arduino as their brain. There is a large global community of makers, comprising experts, fans, students, and artists.

emerged. They have banded together around this open-source platform and produced a staggering amount of freely available knowledge that might be very helpful to both beginners and experts.

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B. Embedded C:

Every project based on an embedded system needs embedded C programming to make the microcontroller work and complete the required tasks. In the modern world, we frequently use a wide range of technology devices, such as mobile phones, washing machines, security systems, refrigerators, and digital cameras, among others. These embedded devices can be controlled using an embedded C code. For instance, while using a digital camera, the microcontroller will perform the tasks required to shoot and store the picture when the camera button is pressed.

Each function produced by embedded C programming is made up of a group of statements that perform a certain set of actions. The fundamental building pieces of the embedded C and C languages, such as variables, character sets, keywords, data types, variable declarations, expressions, and statements, are the same. Each of these elements is essential when developing an embedded C programme.

Hardware architectural knowledge is necessary for embedded system designers in order to create software. These software are essential for managing and monitoring external devices. The microcontroller's core architecture, including its interrupt management, timers, serial connection, and other features, is also directly managed and used by them.

SYSTEM PROTOTYPE:

LIMITATIONS :

- Connecting issue.
- A typical farmer would find it difficult to comprehend how a drone works..
- Need to get permission from the government to use it.

• More feature-rich drones are more costly.

APPLICATIONS:

Indian agriculture needed production and protection techniques to reach high output. Fertilisers and chemicals are frequently needed in agriculture for crop development and pest control. Drones can be used to spray pesticides, fertilisers, and other chemicals depending on the spatial variety of the crops and land. The quantity of chemicals to be sprayed may alter depending on the crop conditions or the intensity of the insect-pest attack.

A platform for vector and pest management might be developed by combining a UAV with a spraying system. For extensive agricultural fields, this site-specific approach is ideal. Heavy lift UAVs are necessary for this task in order to spray a big region. Researchers presented the Quad copter (QC) technology, sometimes referred to as an Unmanned Aerial Vehicle (UAV). Due to the tiny size of the quadcopter, the technology may be used for both indoor and outdoor crops.

By spraying from lower altitudes, pesticide application by drone may be utilised to lessen environmental contamination in all situations, including those where manpower is hard to come by. By requiring extremely accurate site-specific treatment, it also has the potential to enhance pest control for both small and big agricultural fields. Researchers studied how wheat canopy and powdery mildew prevention in Asian countries were impacted by UAV (UAV N-3) spraying settings at different operation heights and varying pesticide dosages.

Conclusion

In this project, we've provided a design for a drone-mounted spraying system for both agricultural and disinfection applications.This technique for applying pesticides and fertilisers to agricultural fields decreases the amount of labour, time, cost, and risk to the people doing the actual liquid application. Additionally, this drone may be used to spray disinfectant substances over inhabited areas and waterways. Precision agriculture with UAVs is still in its early stages, and there may yet be room for technological and agricultural application advancement. Fortunately, this has been addressed with the advancement of UAV technology, better image processing methods, lower costs, longer flight lengths, more powerful batteries, new camera designs, smaller volume sprayers, and different nozzle types. Numerous experimental research have been done on

Future scope

1. It can be utilised to sanitise vast hotspot areas during the COVID 19 pandemic without physically travelling there.

2. Manual control can become autonomous control with GPS technology and the opportunity to return home automatically.

3. Using image processing methods, the drone may be used for surveillance to find insect infestations on plants..

4. Coloured images taken by quadcopters are good at giving a complete picture of common local problems and health.s

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