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Design & Model Making of Emergency Medicine Supply Drone

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Abstract: Our study involves the implementation of a drone-based medicine delivery system utilizing the KK2.1.5 Flight Controller Board for Multirotor Drone. Our optimized drone is specifically designed to deliver medicine in rural areas, where transportation infrastructure may be lacking or geographical terrain may be difficult to traverse. Also, it can be used for contactless delivery of medicine in pandemic situation This innovative technology has the potential to be of great benefit in areas where traditional transportation services are inadequate or unavailable.

I. INTRODUCTION

Drones have become a universal presence in our modern, rapidly advancing world, and have proven to be an invaluable invention in the last decade. Their applications are numerous, including military organizations using them to patrol dangerous areas and monitor for potential threats or illicit activities, providing efficient and convenient surveillance. In the field of farming, drones have been utilized to spread medicine in organic fields, as well as for the safe and easy disposal of pesticides over crops. It's clear that the implementation of drones has brought about a revolution in various fields, with their innovative technology facilitating tasks that were previously difficult or impossible to achieve. We've developed a drone that can deliver essential medicines to areas where traditional transportation methods are unavailable. Our innovative drone is capable of delivering medicine to locations that are inaccessible to regular mechanical vehicles used by most delivery agencies. In times of pandemic, where social distancing is crucial and human interaction should be avoided, our unmanned drone medicine delivery system can be a powerful tool in the fight against the spread of disease.

Moreover, in emergency situations such as natural disasters, when conventional transportation infrastructure is disrupted, this automatic drone delivery system can save lives with minimal effort and resources. It's clear that the implementation of such a system could make a significant impact on the lives of those in need, particularly in remote or disaster-affected areas. Fast-paced urban centres often experience the drawback of slow-moving traffic jams. In India, late delivery of medicines to health organizations has resulted in numerous fatalities.

Our drone delivery project can be a valuable asset for efficient delivery of medicine in cities where traffic congestion and poor road conditions present significant challenges. By utilizing drones to deliver medicines, we can overcome the limitations posed by conventional transportation methods and ensure timely delivery of crucial medical supplies. With our innovative technology, we aim to provide a reliable and efficient solution to the problem of delayed medicine delivery in urban areas. As the population continues to grow and the number of private vehicles increases, it's likely that we will see a significant increase in traffic on city roads. This influx of vehicles can lead to congestion, making it increasingly difficult for commuters to navigate and causing significant delays. If left unchecked, this trend could have far-reaching consequences for the environment, public health, and quality of life in urban areas. It's clear that effective measures need to be put in place to manage traffic and ensure that our cities remain accessible and liveable for all residents. In light of these challenges, it's clear that we need to explore alternative transportation options that can alleviate traffic congestion and improve mobility in our cities. One potential solution is to develop a more efficient air transport system. Our project represents a small but significant step towards achieving this objective. By utilizing drones for medicine delivery, we can reduce the reliance on traditional transportation methods and create a more streamlined and effective system for delivering crucial medical supplies to those in need. With continued innovation and investment in this field, we may be able to develop an air transport system that can address the growing transportation needs of our cities, while also reducing congestion and minimizing our impact on the environment. Our device represents a significant step towards solving many of the problems associated with inefficient medicine delivery and related health issues. With our cutting-edge technology, we are confident that we can address the challenges facing modern medicine delivery and provide a more effective solution for those in need.

II. SYSTEM OVERVIEW

A. Quadcopter

A quadcopter, as the name suggests, is a type of drone that is powered by four rotors. This configuration provides a stable and agile platform for aerial navigation, allowing for precise control and manoeuvrability. Unlike traditional helicopters, which typically use a single main rotor and a tail rotor for stabilization, quadcopters rely on their four rotors to maintain balance and orientation in the air. This design has become increasingly popular in recent years due to its versatility and ease of use, and can be found in a wide range of applications including photography, videography, and package delivery.

Whether used for recreational or professional purposes, quadcopters offer an exciting and innovative way to explore the world from a new perspective. Our quadcopter is built on the F450 frame With Integrated PCB, which provides a sturdy and reliable foundation for our flying platform. To control the quadcopter's movements and maintain stability in the air, we have integrated the KK2.1.5 Flight controller as the primary microcontroller. At the heart of our quadcopter is the flight controller, which serves as the brain of the device. In our project, we have developed a manually operated quadcopter that can be controlled using a remote. The remote sends radio signals to a receiver that is connected to the flight controller, allowing the operator to control the speed and direction of the quadcopter.

The flight controller uses this information to regulate the rate of speed of the DC brushless motors by sending signals to the electronic speed controllers (ESCs). These motors play a crucial role in determining the payload capacity of the drone, as they must be powerful enough to lift and manoeuvre the quadcopter in the air. With our carefully calibrated flight controller and powerful DC brushless motors, our quadcopter is capable of performing a wide range of tasks with precision and efficiency. sufficient for the purpose of carrying medicines. Our quadcopter is equipped with high-quality motors that are capable of providing a maximum payload of 1200kV. This makes it ideal for carrying a wide range of payloads, including essential medicines and other medical supplies. To facilitate the transportation of these items, we have attached a specially designed box to our drone. This box is lightweight and durable, and is designed to securely hold the medicines in place during transport.

III. WORKING

There are several key components that make up the complete working of our drone delivery system. These include:

A. Flight Controller

The brain of drone is flight controller. In this project we have used a The KK2.1.5 Flight Controller Board is an electronic circuit board designed for use in remote-controlled quadcopters, helicopters, and other types of multirotor aircraft. It is a popular choice among hobbyists and DIY enthusiasts due to its affordability and ease of use. The KK2.1.5 board features an Atmel Mega644PA 8-bit microcontroller, which provides the processing power for the board's various functions. It also includes a range of sensors, such as an accelerometer, a gyroscope, and a barometer, which are used to measure the aircraft's orientation, movement, and altitude. One of the key features of the KK2.1.5 board is its user-friendly LCD interface, which allows users to easily configure and tune the board's settings.

The interface displays real-time flight data, including pitch, roll, yaw, and altitude, and allows users to adjust the board's PID (proportional-integral-derivative) settings to optimize the aircraft's flight performance. The KK2.1.5 board also includes a range of built-in safety features, such as a low-voltage alarm, which alerts users when the aircraft's battery is running low, and a failsafe mode, which will automatically land the aircraft in the event of a radio signal loss. Overall, the KK2.1.5 Flight Controller Board is a reliable and affordable option for those looking to build or modify their own multirotor aircraft.

B. Electronic Speed Controller

An electronic speed controller plays a crucial role in the functioning of a quadcopter as it controls and regulates the speed of the DC brushless motors. It works by providing signals to the ESC, which then regulates the rate of speed of the motors based on the input received from the flight controller. The timing pulses of the current delivered to the windings of the motor can be changed to control the speed of the motor. For this project, 4 electronic speed controllers have been used to control the 4 DC brushless motors of the quadcopter. The electronic speed controller generates the 3-phase AC power supply to run the electric motors. It uses a trapezoidal wave generator and generates three separate waves, one for each wire connecting the motor. By changing the timing pulses of the current delivered to the windings of the motor, the speed of DC brushless motors can be controlled.

C. Brushless DC Motors

A quadcopter typically uses four DC brushless motors to power its flight. The speed of each motor is precisely controlled and regulated by an electronic speed controller, which adjusts the frequency of 3-phase electric signals to maintain stable flight. These motors run on DC electric power supplied by a switching power supply, which converts incoming voltage to an AC signal to drive the motor. The rotor of each motor is made up of multiple electric windings, which work together to generate lift and propulsion for the quadcopter. In This Project We Have Used The 1000KV A2212/13T Brushless Motor with Bullet Connector is a high-performance electric motor designed for use in remote-controlled multirotor aircraft, such as quadcopters and drones. The A2212/13T motor is rated for a maximum power output of 1000KV, which means that it will spin at a maximum speed of 1000 revolutions per minute (RPM) per volt of input power. It is capable of delivering up to 230 watts of power at its maximum rating, making it suitable for use with a range of aircraft configurations. The motor features a high-quality brushless design, which provides smooth and efficient operation with minimal maintenance required. It also includes a set of bullet connectors, which make it easy to connect the motor to a compatible electronic speed controller (ESC). The A2212/13T motor is compatible with a range of propeller sizes, and can be configured for use with 2 to 4-cell LiPo batteries. It is also relatively lightweight, with a total weight of around 50 grams, making it suitable for use in a range of aircraft designs. Overall, the 1000KV A2212/13T Brushless Motor with Bullet Connector is a reliable and high-performance option for those looking to build or modify their own multirotor aircraft. It provides smooth and efficient operation, and is compatible with a range of ESCs and propeller sizes.

D. Propeller

Propellers are one of the most important components of a drone, as they are responsible for generating the lift required to keep the drone in the air. They work by converting the rotary motion of the motor into a linear thrust, which propels the drone upwards. The shape and size of the propeller blades play a critical role in determining the amount of lift generated. In addition, the direction of spin of the propellers also affects the movement of the drone. By using a combination of clockwise and counter-clockwise spinning propellers, the drone can be controlled to move in any direction. Quadcopter drone is designed with two pairs of propellers placed diagonally to each other, with one pair spinning clockwise and the other counter-clockwise. This configuration eliminates the reactive torque and keeps the drone stable during flight. The spinning of the propellers generates lift by creating an airflow that results in pressure difference between the top and bottom surfaces of the propeller.

E. Battery

The battery serves as the energy source for the drone, supplying power to all of its electronic components. In our project, we opted for a rechargeable lithium polymer battery (LiPo) with a capacity rating of 2200mAH. These types of batteries have a high energy density in relation to their size and weight, and provide a higher voltage per cell of approximately 3.7 volts. This allows for longer flight times and better performance compared to other types of batteries.

F. Remote

The remote control is an essential component of the quadcopter, enabling wireless communication between the pilot and the flight controller. Our quadcopter uses the FS-CT6B remote, which sends radio signals to the FS-R6B receiver connected to the flight controller. The remote is powered by a 12V battery and is configured using T6 config software, allowing the pilot to customize the control settings to their preference.

IV. FUTURE SCOPE

In our project, we have developed a drone that is manually operated to deliver medicines to a specific location. However, the field of drone technology is continuously evolving, and many companies are focusing on developing fully automated drones that can deliver medicines to remote locations without any human intervention. The development of such drones will revolutionize the delivery of time-sensitive items like medicines to patients at their doorstep. Especially in the current pandemic situation, this technology will be extremely helpful in providing contactless delivery to patients. Drone technology has already shown its potential in various fields and is expected to have even more applications in the future.

V. CONCLUSION

The impact of our project is significant in various scenarios. Firstly, it provides a means of delivering necessary medicines to areas where conventional transportation is not accessible or in regions with challenging terrains. Secondly, it has crucial applications in emergency situations such as natural disasters, where residents and healthcare professionals require vital medicines urgently. Our medicine drone delivery system provides an efficient and reliable solution to such emergencies. Lastly, our drone delivery system can ease the burden on traditional delivery systems in cities, where the increasing population and private vehicles have led to traffic congestion and logistical challenges.

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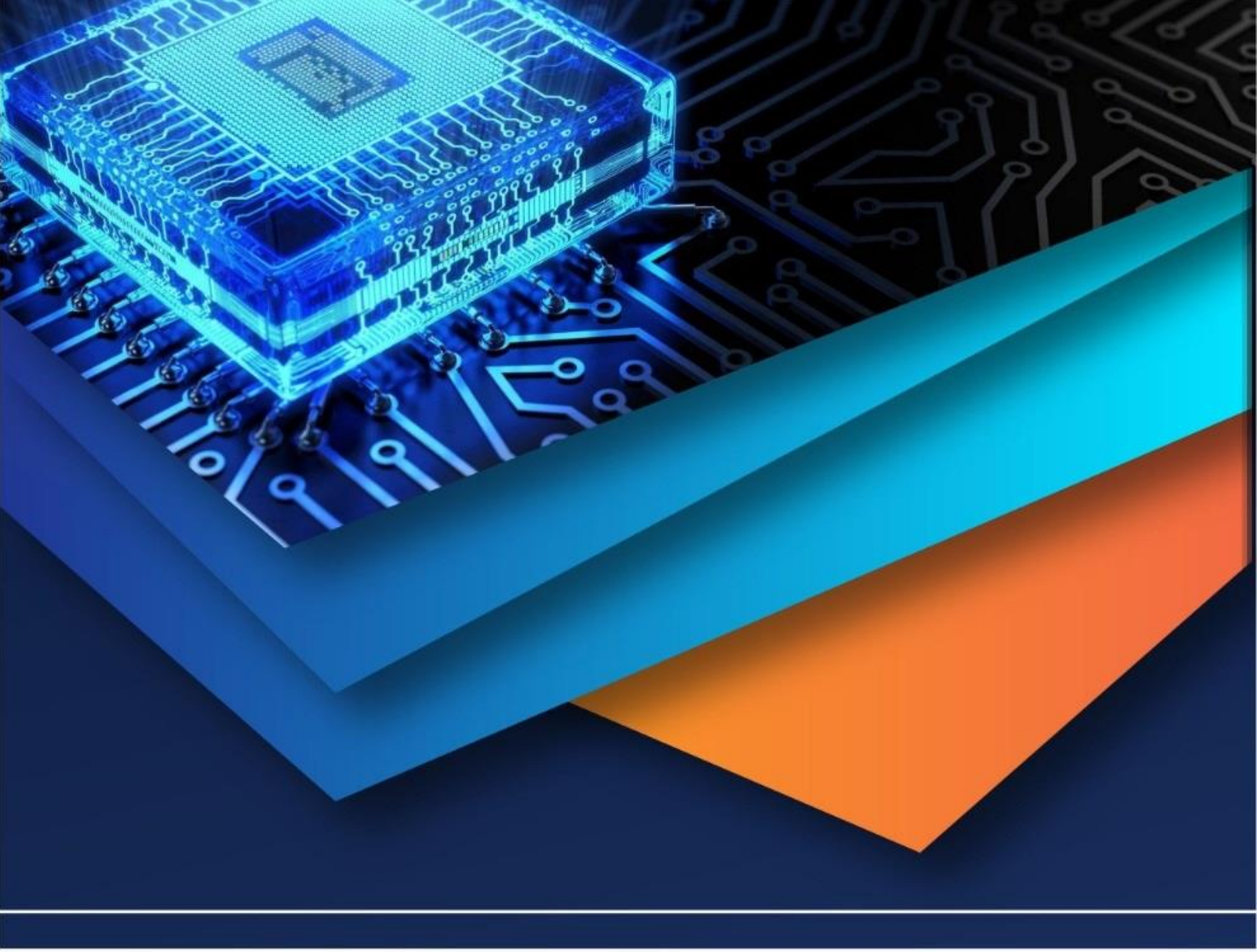

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