Design & Development of Quadcopter with Various Payloads for Pick up & Drop

Rupak Chakole[1], Aditya Giri[2], Sagar Hatwar[3], Sahil Mendhule[4], Manthan lambat[5], Prof. Dr Subhash N Waghmare, Dr I. A. Khan[7]

[1,2,3,4,5]Student *Department of Mechanical Engineering, Priyadarshini College of Engineering, Nagpur*
[6]*Faculty, Department of Mechanical Engineering, Priyadarshini College of Engineering, Nagpur*
[7]*Head of Department of Mechanical Engineering, Priyadarshini College of Engineering, Nagpur*

Abstract - **Unmanned aerial vehicles (UAVs), particularly quadcopters, have emerged as versatile platforms for various applications, including pick-up and drop missions in diverse settings. This paper presents the design and development of a quadcopter equipped with a customizable payload system capable of efficiently picking up and dropping objects of various sizes and weights. Central to the quadcopter's functionality is its versatile payload system, which comprises a modular attachment mechanism capable of accommodating various payloads. This system allows for quick and easy interchangeability of payloads, enabling the quadcopter to adapt to different mission requirements. Additionally, the payload system incorporates advanced sensors and actuators to facilitate precise pick-up and drop operations, ensuring reliable performance in diverse environments.**

INTRODUCTION

A quadcopter drone with multiple payloads is a versatile aerial vehicle designed to carry and deploy various types of equipment, sensors, or payloads simultaneously. Whether used for commercial, industrial, scientific, or military purposes, these drones offer a wide range of applications due to their adaptability and flexibility.

This research attempts to give assistance to persons by employing unmanned drones to carry various payloads. Apps that facilitate the usage of unmanned drones have the potential to assist people in remote areas of the world.

LITERATURE SURVEY

1. Ver Gouw, Bas, et al. "Drone technology: Types, payloads, applications, frequency spectrum issues and future developments. The future of drone use TMC Asser Press 2016.21-45, The Hague,
The purpose of this article is to provide an overview of many types of drones already in the field, their technical specifications, expected payloads and applications concerns, and current and future technological, frequency spectrum advances in drone technology is (Drone) This chapter is, of course, not complete, as technology is constantly evolving.
In this study, many technical characteristics of drones were discussed. This repone describes opens, frequency spectrum concedes, their technical indications, frequency spectrum concerns, and current and future technological development in drone technology.

2. Ver Gouw, Ballater's, frequency De & Custers, B. (2016). Drone technology: Types, payloads, applications, free spectrum issues and future developments in the future of drone use (pp. 21-45). TMC Asser Press, The Hague.
The purpose of this study is to learn how to distinguish between different types of drones based on the type of drone (fixed wing, multirotor, etc.), degree of autonomy, size and one based power supply. These specifications are especially important for drone range, maximum flight pine, and payload capacity. In addition to the drone itself (that is, the "platform"), you can identify different types of payloads, such as: B. Cargo (eg postal packages, medicines, fire extinguishers, leaflets, etc.) and various types of sensors (eg cameras, sniffers, weather sensors, etc.). Describes various payload applications. Drones require (some) wireless communication with ground pilots to complete their flight.

3. Mateen, Farrah J., et al. "A drone delivery network for antiepileptic drugs a framework and modelling case study in a low-income country." Transactions of the Royal Society of Tropical Medicine and Hygiene 114.4

(2020): 308-314.

The purpose of this study is how unmanned aerial vehicles (drones) deliver antiepileptic drugs (AEDs) to epilepsy patients in both emergency and non-emergency distributions in low- and high-income urbanized cities. Is to better understand beneficial.

Drone can significantly reduce the time it takes to deliver life-saving medicines in both emergency and normal situations. Regarding epilepsy, we will discuss the strengths and weaknesses of such a drone delivery approach. However, seen runs of drone drug delivery experimental in related diseases and regions are justified.

4.Mateen, FJ Leung, K.B, Vogel, A.C., Cissé, AP. and Chan, TC. 2020 A drone delivery network for antiepileptic drugs a framework and modelling one study in a low-income country. Transactions of the Royal Society of Tropical Medicine and Hygiene, 114(4) pp.308-314

These papers focused on the transport of automated external defibrillators, blood, laboratory samples, and vaccines that are common in economically prosperous developed counties such as Canada and Sweden in Rwanda, drones are used to transport emergency blood supplies to remote communities. In Malawi, Madagascar and Senegal have poneered a program for bidirectional delivery of specimens, tuberculosis, and important maternal health needs.

We believe that the drone concept can be implemented in poor and densely populated communities with government and community approval. Our research affects a variety of medical conditions and sites. This is a test to see how the commercially available devices currently available can affect patients with inadequate retainment. The results of these calculations are useful for commissioning and testing drone networks in Conakry and other similar locations. This state-of-the-art medical system may help increase public understanding and participation in the treatment and DE stigma of epilepsy.

5.Ling, Geoffrey, and Nicole Draghic. "Aerial drones for blood delivery." Transfusion 59 52 (2019): 1608-1611.

a. Aerial drones have already been used to improve medical care, especially blood transport Aerial photography, rapid shipping and delivery, disaster management, search and rescue, crop monitoring, weather tracking, law enforcement, and structural assessment are just a few of the uses of aerial drones. This widespread use is expected to accelerate advances in drone technology and reduce costs at best. The use of drones reduces laboratory testing time, enables just-in-time life-saving medicines/equipment delivery, and reduces routine prescription treatment.

b. Drones provide better healthcare by enabling faster response times, lower transportation costs, and improved medical products/services in rural and poorly serviced areas

Quadcopter Drone: A quadcopter, also called Quadro copter, or quadrotor is a type of helicopter or multicopter that has four rotors.

Although quadrotor helicopters and convertiplanes have long been flown experimentally, the configuration remained a curiosity until the arrival of the modern unmanned aerial vehicle or drone. The small size and low inertia of drones allows use of a particularly simple flight control system, which has greatly increased the practicality of the small quadrotor in this application.

Unlike conventional helicopters, quadcopters do not usually have cyclic pitch control, in which the angle of the blades varies dynamically as they turn around the rotor hub. In the early days of flight, quadcopters (then referred to either as *quadrotors* or simply as *helicopters*) were seen as a possible solution to some of the persistent problems in vertical flight.

Principle Parts
The Quadcopter c o n s i s t s of following principal parts.
1. Propeller

2. Drone motor
3. Electronic Speed Controller
4. Flight Controller
5. GPS module
6. Landing Gear
7. Receiver
8. Battery
9. Camera

1. Propeller:
Propellers are integral components of the drone. They push the air downwards to maintain the height during the flight. Propellers also assist in moving in all directions.

Plus, some advanced propellers are being designed to reduce the noise of drones during the flight. DJI Mavic Pro Platinum and other such advanced drones are using this kind of propellers.

2.Drone Motor:

Drones are using brushless motors nowadays. It provides more thrust and consumes less battery. In its early days, the motors were not that efficient. The brushless motors also produce less noise with more stability.

3.Electronic Speed Controller:
The electronic speed controller is the circuit to check the motor's speed. It also controls the direction of the drone and works as a dynamic brake. ESC also converts the direct current to an alternate current to run the brushless motor of the drone.

Hence, it can be said that it is the most important part of the drone body. If you are assembling the drone by yourself, you need to cater to this one carefully with your requirements of the drones.

4.Flight Controller:
Flight Controller: What it is and How it Works A flight controller, or "FC", is the brain of an FPV drone. It's a circuit board equipped with sensors that detect the drone's movements and user commands. With this information, the FC adjusts the speed of the motors to move the drone in the desired direction.

5. GPS module:
It is the combination of the receiver and magnetometer. GPS Module is used to provide longitude, latitude, and compass navigations from a unanimous device. GPS Module is also required for the waypoint, return to home, and many other advanced autonomous flight modes.

In addition to the GPS, some of the latest drones also contain GLONASS. GLONASS is the Russian equivalent to American GPS.

6. Landing gear:
The landing gear provides safety to the drone body while landings. Some high-profile professional drones like Yuneec Typhoon, DJI Phantom 4 Pro, must have it. However, its application also depends on the surface on

which the drone is going to land. The rougher the surface the more it is required.

Some of the pilots prefer leg height landing gear in the high grass areas to prevent any mishap while landing.

7. Receiver:

As the remote-controlled drone functions on the signals system. The receiver is one of the main components, it receives the signals from the remote controller during the flight, and signals provide the instruction to the drone. Usually, a standard RC radio receiver is used in the drones.

8. Battery

Lithium Polymer (LiPo) batteries are commonly used in the drone. It offers great power, density, and durability in the drone's life.

Plus, the professional pilots always carry spare batteries with them to prevent the disruption in their shooting due to the battery becoming low.

However, certain high-end drones like DJI Inspire Pro, DJI Mavic Mini, DJI Phantom 4 Pro v2.0, etc, provide up to 30 minutes of flight time with a single charge of the battery.

9. Camera:

The camera is one of the essential parts of every drone. It allows us to make fantastic pictures and videos. Today's drones usually have full HD or 4K resolution cameras with 60 fps or more.

Problem: - A quadcopter drone with multiple payloads is a versatile aerial vehicle designed to carry and deploy various types of equipment, sensors, or payloads simultaneously. Whether used for commercial, industrial, scientific, or military purposes, these drones offer a wide range of applications due to their adaptability and flexibility.

This research attempts to give assistance to persons by employing unmanned drones to carry various payloads. Apps that facilitate the usage of unmanned drones have the potential to assist people in remote areas of the world. Drone technology uses are predicted to expand as a result of this study. This project's timetable was split into two parts: pre-departure and post-departure.

METHODOLOGY

3.1.1 Finding Problem: -Problems related to the rural areas for persuing the need of essential goods at pandemic areas.

3.1.2 Collecting research paper: -Collecting research paper from the internet on the design and development of quadcopter with various payload for pickup and drop. Collecting research paper on sensor operated quadcopter drone collecting research paper on quadcopter drone.

3.1.3Project proposal: -Making a project proposal for the selection of project and experiencing our ideas with project in charge and getting suggestion and implementing that suggestion and submitting the

project proposal to the project in charge.

3.1.4 Selecting area of work: -After project finalization we have to decide and area of work with respect to the residence of group members as the suitable area of work is our group member house college workshop and other workshop for fabricating some complex components.

3.1.5 Making CAD model and animation of machine: Making and CAD model of machine for clearing all the concepts related to the machine. Making the animation of machine for explaining the working of machine.

3.1.6 Finding resources: -Resources should be fined for fabrication of machine it requires some prefabricated parts which are readily available in market also the complex parts should be from various workshops finding the materials and work piece for fabricating those parts.

3.1.7 Collecting different components: -After fabrication and purchase of all the components all the components should be collected from various locations at the workplace.

3.1.8 Assembly: -Assemble all the components of our model according to their proper position and check they are work proper or not.

3.1.9Trial on project: -Take a trial on project and find out some parameters such as
  1. Endurance Test with Payloads.
  2. Check the sensor sensing power.
  3. Stability of drone.
  4. Autonomous Flight Test.

WORKING

A quadcopter drone really only needs four moving parts to fly. Think of each propeller, shaft and motor as one "moving" part since they are all rigidly connected. The quadcopter receives control commands from the transmitter and sends them to the flight controller.
The brain of the drone is the flight controller. It interprets the commands and sends signals to the motors through electronic speed controllers (ESCs).

All flight mechanics of the quadcopter are simply achieved via speed modulation of these motors.
The complex answer will take a little longer. We'll get into that more below, but first it will take a little background information. To fully understand how a quadcopter generates lift, you first need a basic understanding of flight physics. Or, what makes an object "fly". I promise not to get too technical, but even a little bit of physics requires some math.
Flight would not be possible without lift. Lift is the upward force generated on an object as it moves through a fluid, in this case air. Lift counteracts the force of gravity.
The standard model of physics says in order for an object to move in any given direction, the sum of the forces on the object in that direction, must be greater than zero. In other words, the lift force needs to be larger than the force of gravity.

CONCLUSION

Overall, the purpose of this project was to improve access to carry maximum payload in India by applying technical ideas and design concepts to drones, remote rural areas to make connectivity easier. UAV, arm, and payload designs allow delivery of essential products in emergency such as medical and biological components. Transporting most essential products in emergency using unmanned aerial vehicles (UAVs) will reduce distress and help many Chinese residents recover from their illness. In fact, according to a survey, "70.3% of individuals who need hospitalization (in India) are not hospitalized due to financial difficulties." Due to the delivery of medication, the number of individuals who need hospitalization is the smallest. It is limited and reduces the overall percentage and cost. Of medical services related to hospitalization.
In summary, rural India has many different products requirements. Therefore, to properly handle many needs, it is necessary to create a pick-up and drop drone network to provide various supplies to people in remote areas. Products mainly required in rural India such are Blood, medicines, portable medical devices, etc. are available. Development of drone with multiple payloads delivery systems using unmanned aerial vehicles (UAVs) can benefit many people.
Finally, this study provided insights into the feasibility of the goals aimed at achieving them. The team designed and manufactured a drone with an arm

attachment that could carry multiple payloads. As a result, semi-automated UAV design and testing effectively supported the idea of deploying drones to deliver essential products to the Indian rural areas.

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