RESEARCH ARTICLE OPEN ACCESS

Drone Delivery System: For Medicine and First Aid Emergency

Harshit Mali[1], Amogh Chemburkar[2], Anish Pashte[3], Prakash Choudhary[4], Prof. Supriya Dicholkar[5]

Department of Electronics and Telecommunications Engineering, Atharva College of Engineering
Malad-Marve Road, Charkop Naka, Malad (West), Mumbai-95
University of Mumbai, India
[1]maliharshit-extc@atharvacoe.ac.in,[2]chemburkaramogh-extc@atharvacoe.ac.in, [3]pashteanish-extc@atharvacoe.ac.in,[4]chaoudahryprakash-extc@atharvacoe.ac.in,
[5]supriyadicholkar@atharvacoe.ac.in

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Abstract:

The IoT industry and its applications have experienced rapid growth in recent years, and many countries have developed logistics services. Unmanned aerial systems, commonly referred to as drones, are becoming increasingly prevalent in modern logistics operations. Drones were originally introduced as military weapons, primarily used for surveillance against targeted attacks. Since then, the application and usage of this technology has evolved to encompass a wide variety of labor-intensive and complex tasks across all industries. Drones can be built to perform specific tasks with benefits such as: B. A medical drone that saves lives by providing medical assistance. The idea of using medical drones is not new, but it has grown in popularity over the past decade. Delivering relief supplies to remote or hard-to-reach areas is a feature that medical drones can provide to support medical teams. They can spot injuries more quickly at critical points and deliver supplies to stabilize the situation until medical teams arrive. When this drone comes out, it will be very useful and have a positive impact on the medical industry as it will perform useful services that will improve medical services. Additionally, the COVID-19 pandemic has further accelerated the need for alternative secure and contactless delivery models. This has increased the global demand for drone delivery services.

Keywords — Drone, last mile delivery, medicine delivery, raspberry pi, unmanned aerial vehicle

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I. INTRODUCTION

As the name suggests (UAV), drones, aerial vehicles refer to aircraft and unmanned vehicles controlled by a controller or using a companion computer without an operator. Today most drones are operated manually, but internet-connected drones can perform long-range autonomous missions. Therefore, it can transport light packages over long distances more precisely to remote areas in case of emergency. Delivery terms take longer due to its location. In case of emergency, it means it can be used after earthquakes, floods or extreme weather events. It can also provide medical kits. Areas such as ski areas and amusement parks are usually full of tourists people scattered all over enjoying their time. However, in an emergency, it will be difficult to hurry and approach the patient or injured person. You don't just need time to determine the location of the injured, but can also take a long time to reach the distance you have to travel to get there. This project helps here effectively.

II. LITERATURE SURVEY

In this paper, they have provided a way to enhance the medical services in some places, which in our

case are amusement parks. This is achieved by having a group of drones that can easily locate a location through GPS and travel to the required destination where the emergency has occurred. In addition, the phone app will be used for further communication with the main station so the right aid is delivered on the accident's location. The project is considered to be a contribution to benefit the society and make the medics job easier and more efficient. As future plans, they are aiming to expand the number of medical drones used in the system to provide services to the region and worldwide.[1]

The authors of this paper have given a basic idea about how to use a drone for delivery purposes of lightweight packages. Also, they have opted for autonomous techniques rather than using manual ones for delivering the packages.[2]

III. GENERAL DRONE OPERATION

Four full rotor components that are joined to a centre unit at regular intervals make up the core Quadcopter design. The thrust it produces is perpendicular to the vehicle and is all situated inside the same plane.

Given a particular power input, each will function as anticipated and provide the same amount of push. Any one of the four rotors' angular momentum produces a torque around the vehicle's inertial centre of mass, which may be efficiently counterbalanced by the torque exerted by the opposing rotor. In order for this design to work, neighbouring rotors must spin in opposing directions while the opposite-facing rotors must spin in the same direction.

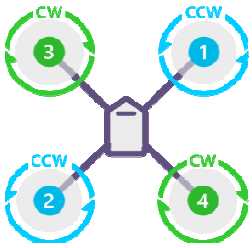


Fig. 1 Propellers Direction

Objectives:

- To deliver the products quickly to virtually any location.
- To improve the time management for all parties.
- To conserve energy.
- To reduce the consumption levels.

IV. MAIN COMPONENTS

1. Raspberry Pi

Here raspberry pi is controlling the operation of sending the command to the drone such as TAKEOFF, LAND, etc . It uses pymavlink as a library which is based on MAVLINK protocols. Here the flight controller is connected to gps module (neo 7m) which helps the drone to know its current coordinates and sends this data to raspberry pi to move in the direction of target coordinate.

Fig. 2 Raspberry Pi

2. Flight Controller

A flight controller, or "FC", is like 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. All flight controllers have basic sensors like gyroscopes (gyro) and accelerometers (acc), while others may include other sensors such as barometric pressure sensors (barometer) and compasses (magnetometer). The FC can also serve as a hub for other drone peripherals like ESC, GPS, LED and servos. As technology advances, flight controllers are getting smaller, more feature-packed, and using better processors and hardware.

Fig. 3 Flight Controller

3. GPS Module

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.

Fig. 4 GPS Module

V. CONSTRUCTION AND PROPOSED METHODOLOGY

The first component is Raspberry pi which is connected to the IMU(Inertial Measurement Unit) that is a device used to detect the orientation of the drone. Further Raspberry pi is connected to the GPS module which gives the coordinates of the current location of the drone. Raspberry pi will process the information coming from the receiver which is the geolocation of the customer. Then the IMU & GPS produces the output to the flight controller which then produces PWM signal to the ESC(Electronic Speed Controller) through which the motors are drived.

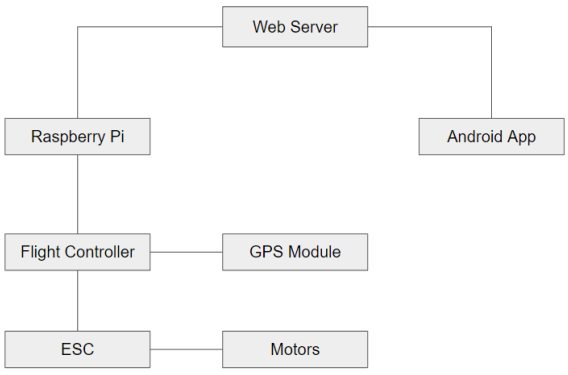


Fig. 5 Block Diagram

VI. CALCULATION

Components	Number of quantities	Mass of one quantity (gram)	Total mass (gram)
Motor	4	60	240
Battery	1	400	400
Structure and other components	1	1	300
Total Empty Mass			940

Table-1: Total mass of drone

Now, total mass lifted by drone,

$$m = \frac{thrust}{acceleration\ due\ to\ gravity} = \frac{T}{g}$$

$$m = \frac{\left[\frac{\pi}{2} D^2 \rho P^2\right]^{1/3}}{g}$$

Again,
P = propeller constant x (rpm / 1000) $^{\text{power factor}}$

For, propeller (10" diameter × 4.5 Pitch), propeller constant is 0.144 and power factor is 3.2. Here, rpm of the motor = 9993.
Hence, P = 0.122 x 9.9933.2 = 192.92 W
Therefore,

$$m = \frac{[\frac{\pi}{2} \times 0.254^2 \times 1.255 \times 192.92^2]^{\frac{1}{3}}}{9.81}$$

= 1.650 Kg

VII. PRINCIPLE FUNCTIONING

The drone will start the journey with the medical package at the desired location. Before flying, GPS coordinates are transmitted to the onboard system via an app on the phone. The drone will start flying towards a certain location according to GPS coordinates. After reaching the destination, it will consign the package and start the journey to the original point with the same route.

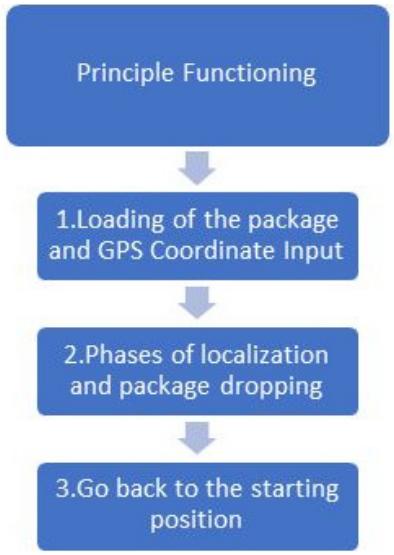
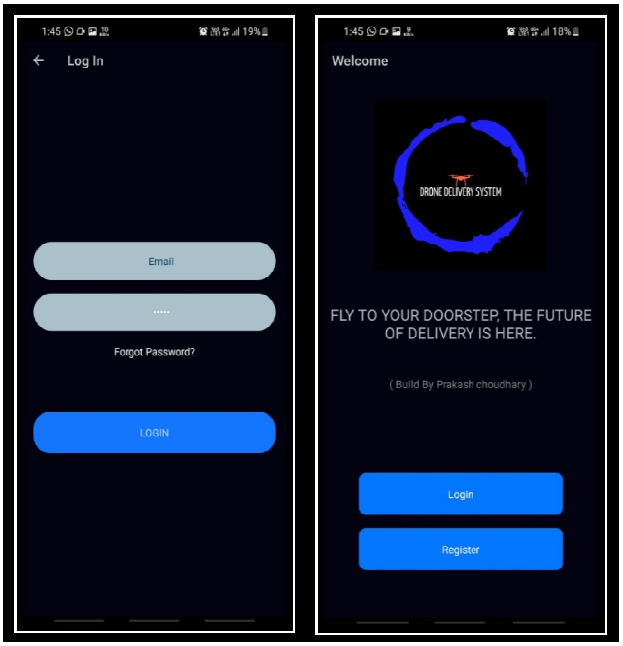


Fig. 6 Principle Functioning

Stage 1: In this stage, the necessary medical package is attached to the drone at the bottom, then all the parameters of the drone will be checked like battery capacity, orientation, speed etc. The destination GPS coordinates are then provided as input to the on-board system.
Stage 2: When determining an emergency location, a signal will be sent from phone app to server, using GPS as navigation system, the drone receives the signal from the server and flies accordingly on the designated path until it reaches destination.
Stage 3: During this phase, after dropping the package onto the destination drone is configured to return to its original position, i.e. it returns to the starting position from which the trip began.

VIII. MOBILE APPLICATION

Mobile Application consists of a button which when pressed sends the GPS coordinates to the server which is then fetched by drone and fly to the direction of coordinates.
Installation : when the person first installs the app it is asked to register with fields such as email password mobile no and name.



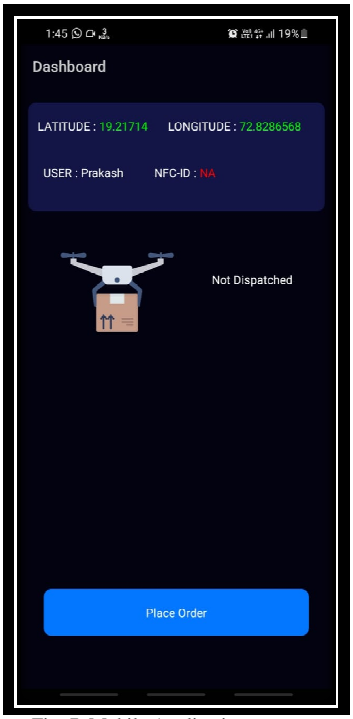


Fig. 7 Mobile Application

IX. HARDWARE

Fig. 8 Hardware

X. CONCLUSION

The project's goal is to find a means to improve medical care in specific locations like amusement parks. This is accomplished by having a drone with GPS capabilities that can quickly find a position and fly to the needed place where the emergency has happened. The phone app will also be utilised for further contact with the main station to give the appropriate help at the accident site. The initiative is seen as an effort to improve society and facilitate the work of medical professionals.

For future modification we can use a FPV camera for obstacle detection, RFID tags or NFCs can be used for making a locking mechanism using servo motors, expensive sensors and GPS modules can be used for higher accuracy. The battery can also be replaced by solar power.

XI. REFERENCES

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Support for this project was provided by,
Mr. Vikram Shaileshkumar Parikh
Founder/Designated Partner, Jinshaashan Info LLP
+91 9222307880
mailto:vikramparikh90@gmail.com

