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UAV HAND-OVER ENTITY

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Abstract - *UAV is defined as an aerial vehicle that does not carry a human operator, uses aerodynamic forces to provide vehicle lift, can fly autonomously or be piloted remotely, can be expandable or recoverable, and can carry a lethal or nonlethal payload. This work presents the construction of hexacopter that would help in delivery of emergency products to customer's destination with the minimal number of humans involved in the process. The hexacopter consists of an FPV camera that would assist the operator to control the flight, avoid obstacles and help them in delivering the product to desired location safely. This UAV can also be used for surveillance, last-mile product delivery, postal services. This system also contains a DC pump that would help in agricultural works like spraying chemicals, pesticides and protecting the crops from pest by regular monitoring. The advantages of the system include increased delivery speed in traffic and ability of the UAV to move in congested environment would help in reach the remote difficult places easily. This system is constructed using flight controller, ESC, FPV camera. An Android application is built for allowing the customer to place the order and also helps us in validating and monitoring the delivery.*

Key words: **Hexacopter, web application, delivery system, spray system, FPV camera, emergency, UAV.**

1. INTRODUCTION

An Unmanned Aerial Vehicle (UAV) is an air-craft without a human pilot aboard. Its flight is controlled either autonomously by on-board computers or manually. The HC (Hexa copter), an emerging UAV is lifted and propelled by six rotors. The basic HC design comprised of six complete rotor together connected at equal distances from each other and a central hub. All the rotors are located within the same plane and placed such that opposite motors rotate in same direction while abutting motors rotate in opposite direction and thrust caused by each rotor is perpendicular to the vehicle. If the rotors are made of parts with the same specifications and expected performance, each will produce the same amount of thrust given a specific power input. It has good manoeuvrability with limitless applications.

The modern hexa copter are evolving into the small agile vehicles. Use of hexacopter can allow faster transport of goods which can ensure on time delivery. Alongside, it can also improve the transportation management. Normally, home delivery of product needs a delivery person and a vehicle for transportation. Hence the lots of resources like fuel, time and human labour is consumed on conventional home delivery.

Observing the real time problems in conventional delivery, like traffic jam and identifying actual delivery location leads to wastage of more of the resources. The drone delivery system can overcome this problem by discarding the use of vehicle and the need of a delivery person.

The aim of the project is to build a hexacopter that would be able to deliver emergency products to the door step so that old age people and people who are not to be walk can get the essential food and medicines to their place without much movement. The system consists of a camera that would help in surveillance. The system also helps government to spray antibiotics chemicals to the places during emergency medical situations and also in agricultural activities like spraying fertilizers, pesticides.

The main objectives of this project include:

- Delivering of emergency products to desired location.
- Accessing the remote places.
- Reducing the delivery time.
- Use of application to connect between customers and the delivery drone.
- Live video streaming of selected places that would help in city surveillance.
- Helps in spraying pesticides.

2. PROBLEM FORMULATION

The delay in reachability of essential and emergency products to a required places results in death of people. The old age people and paralysed people dependence on others for the essential needs. Increased pollution due to increased vehicles as resulted in adverse climatic conditions and affects the human health. Security threats like robbery in remote places are increased. Difficulty in spraying chemicals to control the disease in highly affected regions. Parents find difficulty in tracking their children while playing because of high work schedule.

To establish connection with the people and help them by delivery the essential products to their door step, an application is developed. The products that are required can be order and will be delivered in real quick time for the customer place with low delivery cost. The drone can be controlled and video streaming can be viewed via smartphones helps in solving the problems like remote place surveillance, tracking and monitoring children. A spraying system is attached to help the purpose of spraying pesticides etc.

3. METHODOLOGY

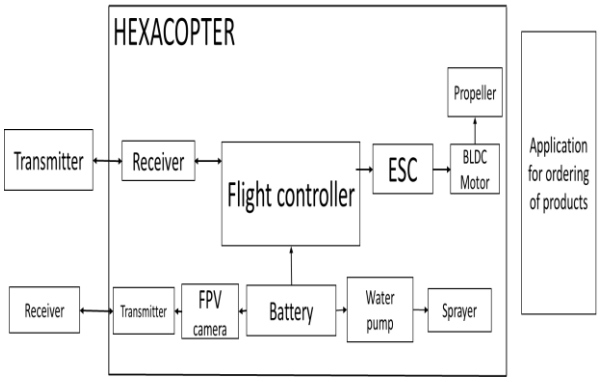


Fig 1: Block diagram of components of hexacoptor

3.1 WORKING PRINCIPLE

The UAV hand-over entity is designed using the above mentioned. This system consists of a flight controller that would help in controlling the hexacopter and coordinating between the user and the drone. The flight controller is integrated with the ESC, motors, battery and propellers that helps in lifting and movement of the hexacopter. The LiPo battery is used to used to power the components of the drone.

Hexacopter is basically UAV which is propelled by six rotors that uses air lifting phenomena. The Radio Transmitter is used to send the commands to flight controller via receiver which is in turn connect to the flight controller that helps in coordination between the operator and copter. The ESC is an electronic component that communicates with motors how fast to spin based on the signal received from flight controller. Each ESC controls a single motor. ESC is connected to power supply. Six 30A ESCs are used in proposed HC. It converts the PWM signal from flight controller or radio receiver and then drives brushless motor. ESC is a circuit used to control speed and direction of motor by varying the magnetic forces created by windings and magnet within motor. The rotation of propeller plays an important role in drone's flight. The two basic concepts involved in drone elevation are thrust and torque. Propellers are made to rotate in clockwise and counter clockwise alternatively to provide the thrust required for the lifting operation. This results in generation of torque in opposite direction and helps in maintaining a balanced and stable system.

Motion of the hexacopter is controlled by three movements that include Pitch rotation: Pitch results in movement of hexacopter in forward and backward direction.

Yaw rotation: This motion results in left and right movement of the copter.

Roll rotation: This movement is about its longitudinal axis that helps the copter to stay in level with the ground.

The hexacopter is mounted with an FPV which enables the sight of flight of the drone, a transmitter (TS832) is used for processing the video that is sensed by the camera and transmission of the signal to the operator. A receiver is used to receive the signals send by the transmitter and this can be viewed through the smart phone.

The copter is installed with an DC motor which is used to pump the water with chemicals from the tank fitted with copter and used for spraying to specified regions with the pipe that is connected alongside with it.

3.2 DESIGN AND IMPLEMENTATION

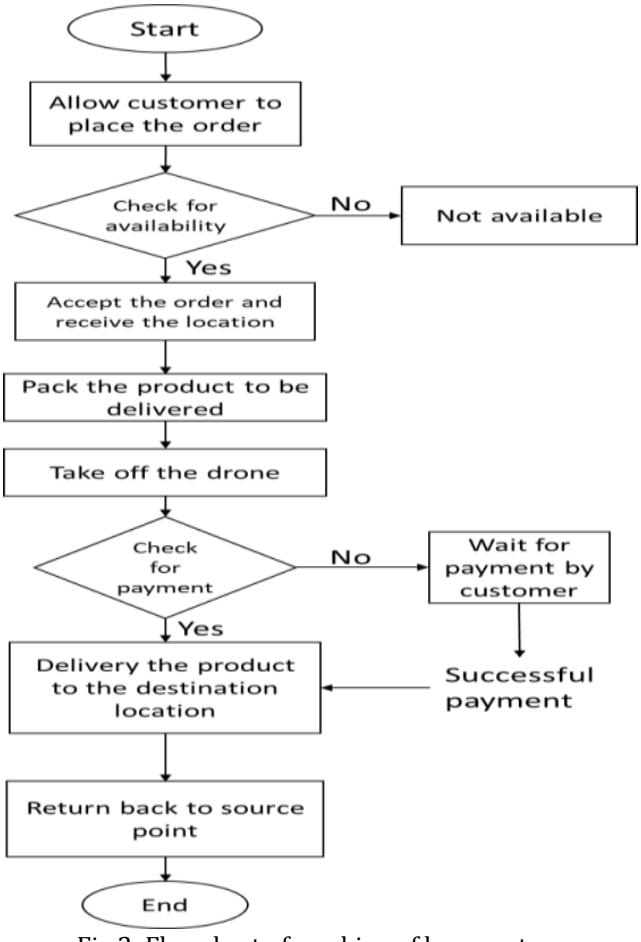


Fig 2: Flowchart of working of hexacopter

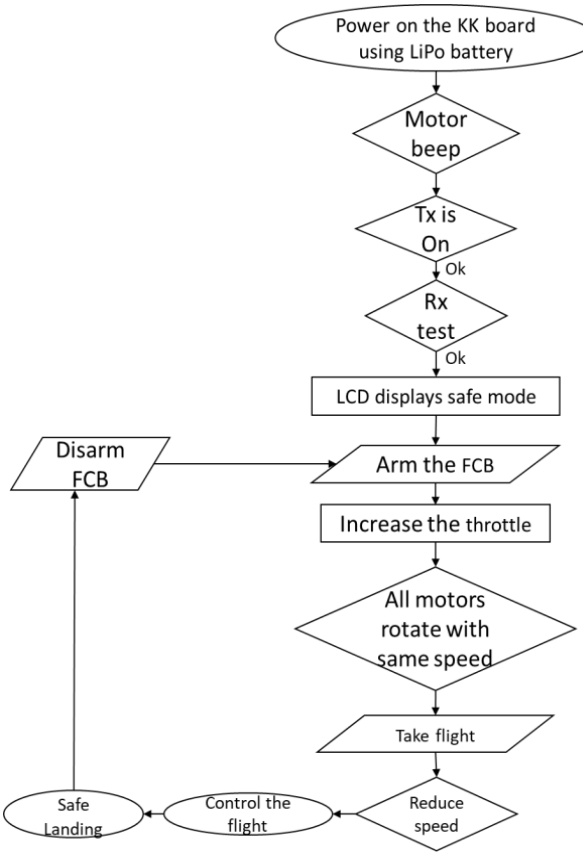


Fig 3: Flowchart of delivery system

The above flowchart of fig 2 explains the working of hexacopter. The power supply is connected to KK board using LiPo battery. With the connection established a beep sound is sent by the controller. Now turning on the receiver and tested for correct working of the RC transmitter and receiver set. After the successful installation and connection establishment the FCB will display armed on the LCD display. Increase the throttle and make sure that the motors are rotating with same speed. Now take flight by controlling with the throttle and reduce the speed. Control the flight directions by moving the throttle in required the direction and allow the copter to make a safe landing and disarm the FCB. If the FCB is not disarmed manually it will disarm automatically after few minutes.

Fig 3 shows the working of delivery system. Android application allows the user to place the order and quantity requirements for them. Then after checking the availability status of the products we accept the order and receive the customer information such as name, phone number, and the address to which the product must be delivered. The product is packed with taken into account the measurement of the box that would fit in for the copter. After the product is placed in the copter delivery box the drone is ready to take off. By using the google maps drone is controlled manually and destination will be reached. After checking for the successful money transaction of the ordered products then deliver of product to the customer is done. The safe and secured delivering of products to end person is done and the drone will return back to the source point.

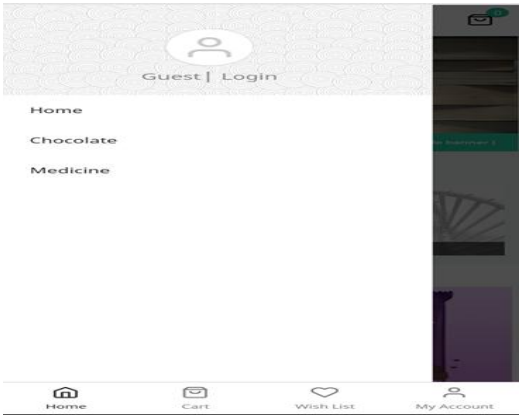
4. RESULTS AND DISCUSSION

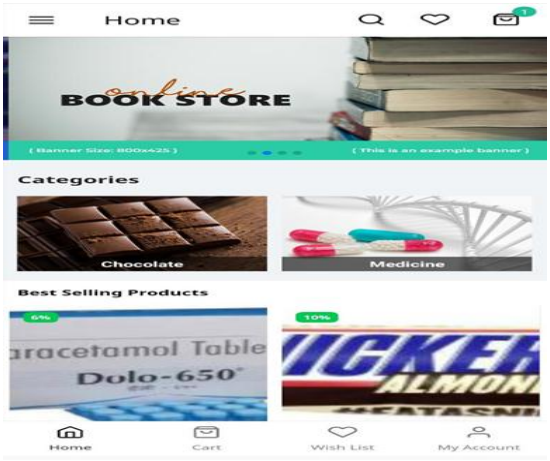
Fig 4 :View of hexacopter with components

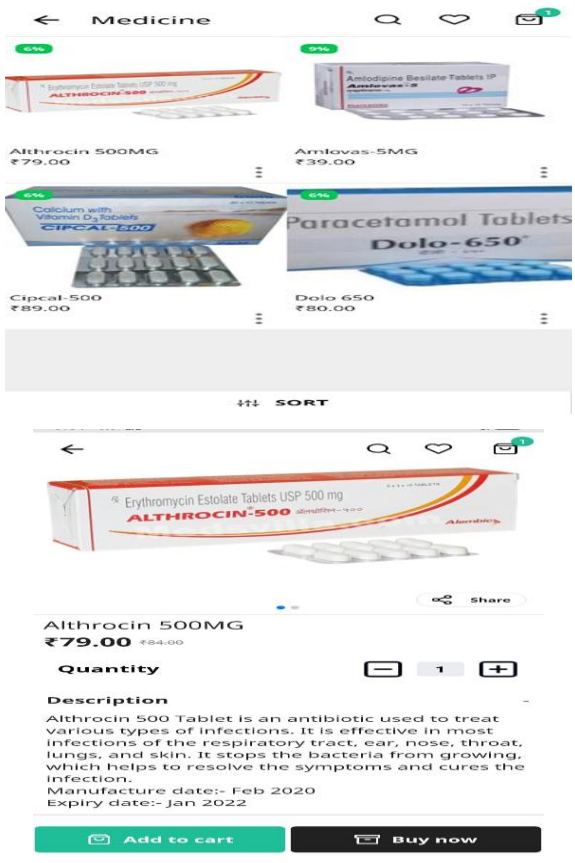
The above fig 5 shows the images of hexacopter with components mounted on the frame. The hexacopter is developed using KK 2.1.5 board which internally as microcontroller ATmega644PA that helps in the controlling by making initial setup and designing as mentioned previously. Each brushless motor has a capacity of lifting minimum of 680g. As this is a hexacopter, the total weight that can be lifted is around 3.5kgs up to a height of 10m. The LiPo batteries here we have used is of 4200mAh for flight controller and motors that would provide a flight time of about 1.5 hours and transmitter can send signals to flight controller upto a range of 800-1000m. For the FPV camera, 3200mAh battery is used that provides live streaming for about 2 hours and transmitter can transmit signals for a range of 4km. The receiver for smartphone is capable of receiving signals for about 300 m range.

Fig 5: Hexacopter with spraying system

The above fig 5 shows the spray system that is installed with the hexacopter for spraying of pesticides which is powered using 3500mAh LiPo which can pump water and we have used 1l bottle for carrying the pesticides.







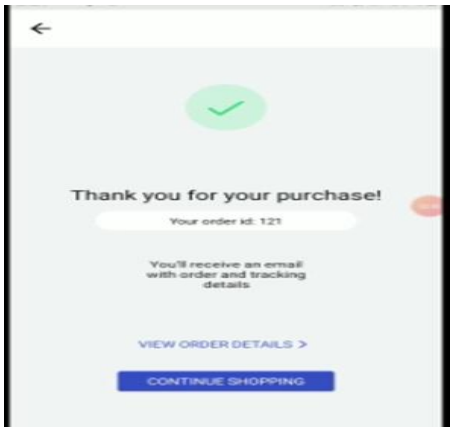


Fig 6: Web application

The figure 6 shows the content in our web application called "Drone delivery". This is an use friendly application which can be installed in android mobiles. Customers can view the products by logging as registered member or as a guest. This application contains two category of products i.e, Chocolates and medicines.

The data of the ordered products and customer details are stored as tables in MySql database. We have used Linux server and for the project purpose we have allotted a storage space of 500mb for gathering the information and this can increased as the demand increases.

5. CONCLUSION

In this paper we have proposed a UAV hand-over entity that would help in delivery of required products to customers with the help of hexacopter. This an eco-friendly system which would help in delivering products quicker than road means thus would help in supply of medicines and other emergency products during difficult times. The spray system helps in no contact spray of chemicals during the unpredicted situations. The drone delivery system will become a huge industry in mere future. In mere future, this can be implemented in spying and help in defence purpose by using advanced sensors and cameras.

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