

SmartUAV's Delivery System using Fingerprint Authentication

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Abstract: In general, it is not possible to complete the delivery of the package competently because the main challenge is insufficient smart technology to identify the user for a package authentication. Therefore, fingerprint authentication is one of the intelligent authentication ideas of the package used as one solution to the above reference problem. The model should be properly prepared with regard to behavioral design in order to incorporate the UAV transport system in cities. The drone activity preparation and fingerprint authentication model for providing solutions is suggested in this regard. In terms of the computing time of the UAV and the optimality difference, the experimental results indicate a feasible solution and provide an efficient solution model..

Keywords: urban transportation; UAV's (Unmanned Aerial Vehicle) drone; package delivery; fingerprint smart cities;

1. Introduction

Smart cities are setting a new example around the globe in terms of digital technology to build open and smart control systems that draw on their creativity and operate on real-time data for emergency services, public transport and security. In terms of low cost and fast, eco-friendly commercial delivery systems, drones and small unmanned aerial vehicles (UAVs) will play an important role in the development of a smart city. Unmanned aerial vehicles (UAVs) can help to deliver small fardels unescorted by any holdup to destinations. The transport facility of UAV could offer various compensation, such as quick delivery, lower operating costs, and eco-friendly, over the conventional truck delivery system. In the past few years, the commercial use of drones has unexpectedly increased. Remarkably, the importance of quick delivery of ordered goods to customers has increased with the help of the growth in the online e-commerce industry. Increasing rapid parcel distribution in metropolitan areas has emerged as a major challenge. It is also necessary to select the correct position to unload the parcel and the roof of the building is the best solution to overcome this problem.

In this research, we suggest a model for the package delivery system of a fast UAV using the best building roof. Whether or not there are technical barricades to beat before the essential period of introduction of urban transport UAVs, it seems that in the near future the delivery of UAV-based packages will become realistic. The distribution of UAV based packages could solve any problem of transparency linked to commercial locations. Cities of residents and buildings are crowded. As a consequence, additional air and sound emissions, hold-up, and traffic injuries result in results. UAV's powered by electric batteries, however, are eco-friendlier as a result, and they travel easily because they are not trusted in road conditions and tie-up.

2. Related Works

2.1. Urban Transportation:

There is the amount of the concept that describes urban logistics, but in general one is seeking the best method for all of them that uses the resources to transport goods effectively in dense urban cities while taking care of some important parameters such as protection, traffic jam, and climate. As the patterns of e-commerce and urbanization have increased, the number of transportation activities in dense urban cities has increased. In order to make our model more realistic in real-world implementations, several key points are taken into account, concentrating primarily on optimizing and running the distribution of the last-mile kit. Today, heavy and light commercial vehicles are primarily involved in urban transport operations. However, it is expected that the efficiency and adeptness of last-mile package delivery in general will be mastered by various types of methods and opinions.

2.2. UAV's-Based Parcel Delivery:

The UAV has been the latest replacement for parcel delivery in recent years. Studies have focused on truck-drone fusion delivery systems to the best of our understanding, rather than concentrating on studies on UAV task planning using the ideal roof of buildings inside cities. The fusion transport model of a truck-UAV needs a qualified individual who can drive and operate UAVs together. Find appropriate spaces for truck parking, not an easy mission, along with UAV activities inside the cities that are stuffed with houses. The distinctive aids are as follows.

- Usually, the easiest operational preparation of a UAV-based parcel delivery using an optimal building roof is suggested.
- Authenticated parcel delivery to the individual concerned by the drone-based device, using fingerprint scanner authentication.

3. Model Development

3.1. Package Delivery Issues in Cities:

Commercial freight transport operations in urban areas suffering from the issue of air pollution and greenhouse gases induced by emissions from commercial distribution vehicles and, as a consequence, the environmental effect of such transport activities are the key reason for traffic jamming and traffic mishaps in towns, as we have previously mentioned. One of the most noticeable challenges in the growth of online shopping is the rise in commercial shipping activities.

Before the online shopping flare-up, people would go to local shops to purchase items they needed in their everyday lives.

3.2. Problem and Assumptions Description:

The UAV model based on the roof has the following benefits in terms of operability over the distribution model of other UAVs. Compared to achieving those activities with moving destinations such as delivery trucks, this model helps the UAVs to locate, track the route, and land on the roof of buildings. In proving a secure touchdown area for UAVs, the roofs of buildings, primarily multilevel roofs, play an important role. Based on range, light detection, and camera sensor response obtained, real-time selection and choice of safe landing area on the roof. In addition, some numerical tests are performed to verify the survival of roof-based drone package delivery systems using fingerprint authentication to achieve vision-based roof landing using a downward-facing camera.

There are numbers of buildings in towns, mostly with a roof with enough space. The roof of the building or distribution center will be the UAV's activity center. A hub-and-spoke network on which UAVs are run and single UAVs can carry a maximum of one package and can fly from the drone command center to one of the delivery locations only because of fixed payloads of the package to be shipped. The delivery model of the UAV is not to swap the traditional delivery model, but to boost it. The demand is reflected by an increase in the amount of packages that each building recognizes and offers. The distance between the delivery location and the roof of the command center is fixed, and the delivery distance is determined in terms of a straight-line aerial route inspection between each endpoint of the delivery location and the operation center of the UAV. In addition to the problem described above, since the weight of the parcel that can be transported by UAVs is limited to 1.5 kg, this is a major problem when we want to deliver multiple packages from single UAV missions at the same time to multiple locations. When the winds are poor and sight is clear due to battery limitation, the current flying distance for the single mission is restricted to about 10-15 km. It can be revived at any moment, as the battery is not fully charged. In Table 1, the overall specifications of the UAVs built to deliver the package are brief.

Table 1. Delivery drone specifications in the case study.

Item Name	Unit	Value
UAV mass	kg	7
Power transfer efficiency	-	0.6
Lift to drag ratio	-	2.5
Power consumption	kWh	0.2
LI-PO power consumption	kWh	0.5

Item Name	Unit	Value
Battery capacity	kW	1.54
Recharging time	hrs	3 hrs
Operating hours	hrs	1.5 hrs
Mission extra time in loading and unloading	hrs	0.25

Since battery drainage is the main problem for the planned UAV mission, we use the worst-case depletion of batteries to solve any battery problems during the flight. Due to the visibility condition of the drones, the UAV's operating hours are only suggested during sunlight, but can be resolved by night vision camera and sensors. Finally, the atmospheric situation, such as heavy winds, does not seem to be taken into account because UAVs do not work under such environmental conditions for delivery. UAV's start shipping packages to one stage using a full battery power to the destination. UAVs must choose what is also delivery or recharging the battery as the subsequent operation at whatever time their previous operation is performed. In addition, to resolve the maximum battery discharge issue, the drone's batteries need to be recharged to the minimum recharge ratio. The cumulative time taken to compete for the task should be less than the drone operating hours of the battery after the package has been shipped and returned to the base station. A theoretical diagram of UAV dependent package distribution using the roof of buildings is shown in Figure 1.

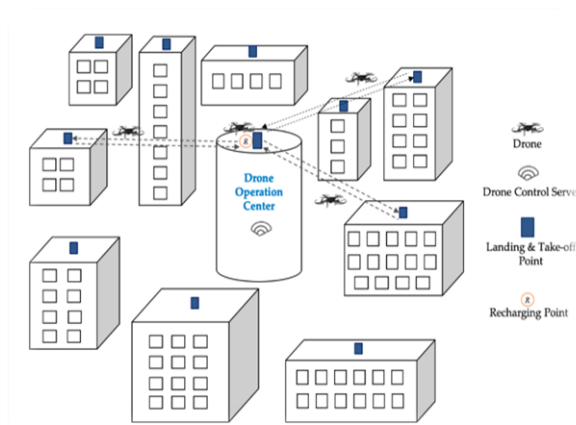


Figure 1. UAV's package delivery model using the roofs of buildings.

3.3. Fingerprint Authentication for delivery of parcel:

After reaching the rooftop of its target, the consumer has to verify its fingerprint on its mobile when the delivery company application asks him to do so. If the product is delivered, the user makes a confirmation about the product delivery by providing the correct fingerprint match message. Afterward accomplishment of endpoint, the UAV's will keep on steadied there for one to two minutes. If fingerprint matches, the message received by the QuadCopter and then the arranged package is conveyed and QC flies back to the initial position using the return to launch option using Ground control application, otherwise the QuadCopter will go back to the foundation point without delivering the package.

Off-Board Controlling System at the drone hub and a software application called Ground Control. The controlling system assists GPS in the QC by giving suitable data after arming (Loading) the vehicle. The android device interfaced with Telemetry of the QuadCopter will trajectory the path and make the drone travel accordingly. After reaching the target, the consumer will give a fingerprint impression and the package is delivered. Figure 2 describes the working model of fingerprint authentication followed at the time of delivery of packets.

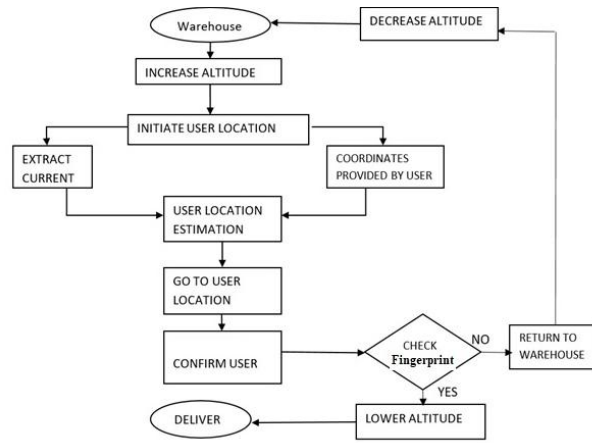


Figure 2: Flowchart of Working Module of Drones

4. BLOCK DIGRAM

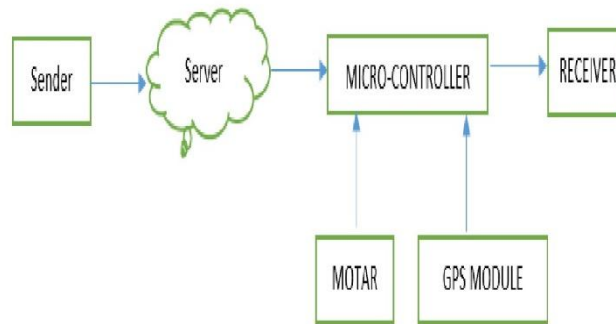


Fig 4.1 Block Diagram

4.1 Pixhawk flight controller

The Pixhawk flight controller is the practice of setting the various types of modes that allow the easy flight of drones in different conditions. It comes with Atti mode, fail-safe, GPS mode, and three modes. With the voltage safety indicator, the flight controller is activated.



Fig 4.2 Pixhawkflight controller

4.2 ESC Controller

An Electronic Speed Controller (ESC) is an electric device to screen and vary the speed of the motors of the Drone during the operation.



Fig 4.3 ESC Controller

4.3 GPS Module

The GPS module is responsible for the provision of the drone longitude, latitude and elevation points. It is a very important component of the drone.



Fig 4.4 GPS Module

Drones will not be able to play an important role in distribution, as important as they are today, without the GPS module. In order to travel long distances, the modules support drones and allow them to store data related to information of specific locations on ground. Without map reading using the FPV, the GPS module also helps them to safely return the drone to the "Ground station." The GPS module assists in returning the drone safe to the

ground station in the supreme recent drones in the situation that the drone loses connection to the ground station. This helps guard the drone safely.

4.4 The Receiver

The receiver is the device responsible for the reaction via the controller of the radio signals directed to the drone. To control a drone, a minimum of four channels are required. To be made available, however, it is best to use 5 channels.

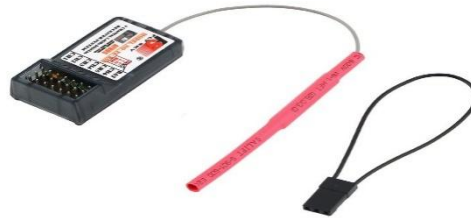


Fig4.5 The Receiver

4.5 The Transmitter

WFT06X-A Transmitter Features (Front)



Fig4.6 The Transmitter

Similar to the receiver, four channels for a drone are needed for the transmitter, but five are usually recommended. In the industry, various types of receivers can be purchased. Essentially, the receiver and the transmitter use a single radio signal in order to communicate with the drone during the flight.

5. Future Work

Different suspicious parameters, such as wind speed, direction, and temperature, are parameters taken into an extra calculated parameter when the mission is planned to produce the package for future research work. As an essential parameter condition for the model, more real-time data should be obtained, processed, and used. Since the location of the center of the drone base station may affect the planning of the drone activity, geolocation for the base station must be taken into account to solve this issue. In addition, for authenticating drone-based package delivery, the rise in the numbers of drone command centers can be considered. Drones could freely fly from one center to another center to charge the battery under the model of multiple drone operation centers, which could increase the operating speeds of the UAVs.

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