Overviews

Topic

Drone express delivery of packages through unmanned low-altitude air vehicles operated by radio remote control devices and self-provided program control devices is automatically delivered to the destination. Its advantages lie in solving distribution problems in remote areas, improving distribution efficiency, and reducing Labor costs. Drone delivery not only drastically reduces distribution costs, but also increases efficiency and solves distribution problems in remote areas. At present, companies including Amazon and DHL are testing many drone distribution shipments. Drones used for business testing are mainly quadrotor or onto-wing type. The flying height is less than 1,000 meters. The flying radius is about 10 kilometers and the load are within 10 kilograms. The drone is very suitable for the delivery of remote areas and emergency items and can effectively improve the distribution efficiency and reduce manpower and transport costs. It integrates a variety of high-precision sensors such as triaxle accelerometers, triaxle gyroscopes, magnetometers, barometric altimeters, and advanced control algorithms. The drone is equipped with a black box to record status information. And it will use the GPS autonomous navigation mode to fly.

Motivation

With the development of artificial intelligence and other technologies, the future technological disadvantages will be further compensated. From manned operations to remote operations to autonomous flights, the transportation of future drones will become more frequent. At the same time, with the upgrade of energy storage technology, the endurance capacity and load capacity will be further enhanced, and the use of Drone in the future will further expand.

In remote areas, the volume of deliveries is small, the distance is far away, and the cost is high. Moreover, the logistics cost is mainly in the distribution link of the last mile. The data shows that in 2016, the global logistics cost is nearly 80 billion US dollars, of which the last one-kilometer transport accounts for the proportion of the total cost. 50%. Therefore, express logistics companies have enough internal driving forces to reduce costs and increase efficiency.

a. The shortest straight-line distance

Drone has a straight line in the air, the shortest distance, almost ignoring the terrain, there is no traditional express delivery route limitations. In the case of DHL's transport in the German towns, the air transport restrictions have more freedom than traditional methods. Take China Post as an example in the pilot project in Anji County, Zhejiang Province. It takes 40 minutes from Hangzhou Hang Zhen to Qi guan Village by car to deliver parts and it takes only 15 minutes to open the drone route. Therefore, the advantage of drones ignoring terrain is even more pronounced in remote areas.

b. Lower operating costs:

Relatively low cost, saving manpower and time costs. According to a study by New York financial research firm Ark-invest, Amazon's delivery service can reduce the cost of delivering small parcels to only about $1. In contrast, Amazon uses conventional delivery services in New York and other cities within one hour. The cost of each delivery is up to 7.99 US dollars.

c. High efficiency and speed:

At present, the mainstream speed of drones in the logistics industry ranges from tens of kilometers to hundreds of kilometers per hour. Taking DHL as an example, the third generation of multi-rotor Drone PARCELCOPTER has reached 70km/h. Moreover, Drones have expanded the efficiency of space use (from flat to three-dimensional) without risk of traffic jams. Therefore, no aircraft will greatly increase distribution efficiency.

d. Suitable for small batch, high frequency transport:

According to Amazon statistics, about 85% of express items are lighter than 5 pounds (about 2.27Kg), which means that many items can be delivered without aircraft. According to the data from the State Post Office, the total number of courier shipments in 2017 will reach 36 billion, and the Institute expects the number of per capita parts to reach 26. Therefore, small batches and high frequency are the key features of express logistics. Compared with other distribution methods, drones have unique advantages in efficiency and cost.

e. Ideal for delivery in remote areas and emergency items:

Disregarding the advantages of terrain, it can fully reach the distribution needs of remote mountainous regions. China Post opened the first drone distribution route in the Andizhan Village area of Zhejiang Province and piloted remote regional distribution services. DHL uses drones to deliver medicines to customers who live on the island, and like Amazon Prime Air's launch of 30 minutes, it also gives full play to the speed of drones and provides customers with more time-efficient delivery. service.

Landscape

DJI drone technology is very mature. Leading position in the world. DJI drones can be used for reference. The main competitor is Amazon Prime Air. Amazon drones can be delivered within 30 minutes from order placement to delivery. It is an important part of Amazon's future e-commerce logistics. Amazon Prime Air is currently mainly used in the suburbs, can cover some rural areas, and plans to deliver goods in urban areas in the future, so that drones can put parcels on the roof. However, the prerequisite for completing the distribution within 30 minutes is that drones can fly 15 miles. The obvious fact is that not all the customer's designated delivery locations are within 7.5 miles of Amazon's warehouse. You can't expect the drone to be ready at all, just wait for the customer to load the package to the customer's home immediately after completing the payment. There are too many preconditions for the delivery of drones, and Amazon has not announced any response in these areas. Drone transport projects can carry greater weight and more transit time than Amazon drones. On the other hand, drone projects are more intelligent.

Aims

As time goes on, technology makes our life more convenient. Our project “delivery drone” is targeted to create a more convenient service for people -- “Drone Delivery”.

During this assignment, our group aim to try a real drone. We aim to buy a small drone which can move under our control. This is the first step of letting our project. Next, if we finish our aim early, we are targeting to install a GPS feature on our drone.

As the result of researching China market which has a relativity perfect delivery system, We found that one of the reason makes China delivery service cheap is the labor. Our Drone delivery project can replace the high labor in Australia. In order to reduce the fees of maintenance, we decide to make the delivery drone more durable by selecting fit material . One of our goals to provide a cheap service for customers.

We aim for ‘5 minuets delivery’. Melbourne’s canteen has a low intensity outside of the city, so in many situation customer need to wait for an hour to get their food. And in now day, drone has a high speed up to 65km/hour. We intend to set our drones delivery under 15 minuets in a suburb. Our target is to provide a faster service for customers.

In our conclusion, we aim to make the delivery service cheaper and quicker.

Plans and progress

Roles

Scope and limitation

In the limit time, our project will force on setting up the mockup .The mockup will record the information of merchant (e.g the opening hours, location, product, price) which is available on our app. And do the order system to calculate the price of the users ordered and the estimated delivery time. Also, these information should be send to the merchant. These information will let them know when the drone will reach their restaurant and what should they need to prepare.

If there is more free time after the last part is done, the GPS will be set up on one drone and test it .To do these, the control system will be created and it will return the signal to our application. And then this information will be send to users, let users know where the food they ordered is.

Tools and technology

The transport drone uses an eight-rotor aircraft equipped with a GPS auto-control navigation system, an GPS receiver, various sensors, and a wireless signal transmitter and receiver. The UAV has various flight modes such as GPS auto-navigation, fixed-point suspension, and manual control. The transport drones can carry packages through unmanned low-altitude aircraft operated by radio remote controls and self-contained program control devices. It can also be automatically delivered to the destination. The drone also has a loss of control protection function. When the drone enters an out of control state, it will automatically maintain accurate hovering and search for empty lands in the vicinity to wait for collection. UAVs transmit data through 4G networks and radio communication remote sensing technologies and dispatch center and self-service courier cabinets, send their own geographical coordinates and status information to the dispatch center in real time, receive instructions from the dispatch center, and receive the destination coordinates. Later, it will use the GPS autonomous navigation mode to fly. After entering the target area, it sends a landing request, a local mission report, and a local operating status report to the destination courier. After receiving the landing request response, the courier guides the drone in the express cabinet. Top landing platform landing, loading and unloading courier, and rapid charging. The drone will fly to the express delivery distribution point after losing contact with the dispatch center or experiencing an abnormal failure. Moreover, the position of the drone is connected to the recipient's mobile phone, and the recipient can check the position of the drone at any time. When the weather changes abruptly, the drone has a sensor that senses it and will return home quickly to wait for the next instruction. This prevents accidents happening.

Testing and Timeframe

In 2015, Russia's Copter Express partnered with fast-food chain Dodo Pizza to launch a drone pizza delivery service. The drone can reach speeds of up to 40Km/h and can carry objects up to 5 kilograms at one time. The machine is equipped with a GPS global positioning system and camera so that the control center can keep track of its position. According to CopterExpress, they are the first companies in the world to provide drone delivery services. Prior to this, they had used small drones to deliver small parcels. Dodo Pizza promised to use a drone to deliver pizza, guarantee delivery within half hour, if the customer wait more than one hour, diners can eat by free . In June of 2015, Domino's Pizza Company in the United States also tested drone delivery service.

,In China, the food delivery company “hungry?” started the drone mode in ShangHai. Their operating model is :

1.The takeaway brother will deliver the customer's meals to the distribution point of drone transport.

2. The drone loaded with meals took off to the destination collection point.

3.Flight is completed automatically by the program plus manual operations.

4. Meals slowly land at the destination hub.

5. The delivery boy who is responsible for the delivery has already waited at the distribution point.

6. The takeaway brother remove the meal and send it to the customer.

7. After each flight, drones need to replace the batteries.

In the entire meal delivery session, drones accounted for about 70% of the total flight distance, but businesses and users could not see drones at all.

Furthermore, Uber participates in the delivery of drone meal delivery service and promises to deliver it within 5 to 30 minutes on May 14, 2018 .

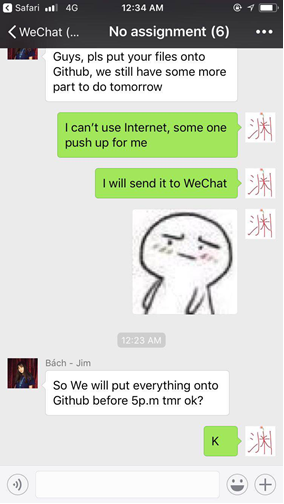
More and more companies are participating in drone food delivery projects. Drone meal delivery services will become a trend in the next five years. For diners, in addition to speed, there is one more important point is not need to tip.

Risks

As a digital devices, it surely will be some risks, the first and the most that people cared is about drone hacking, it is true that maybe the drone will be hacked and will be used to do some illegal activities , maybe hackers will use them to hurt some people or invade other people’s privacy , we will do some actions to protect our system just like what other worldwide company did . Also the drone maybe will crash when it deliver the goods , the goods will be broken , maybe even the people will be hurt . To minimize this probability , we need to monitor the drones’ condition all the time , we will try to improve the drones’ emergency response measures , our first idea for now is airbag in drones , when there comes the height’s sudden drop , the monitor system will detect that and do emergency response measures , the airbag will open and protect the drones and also goods .

Group processes and communications

In conclusion, our group has a good communication with each other, we did meet each other once a week. Because of the final exam is close to this assignment, we reduce times of face-to-face meeting. However, we still meet each other three times face-to-face outside the class time in order to discuss our work. We use ‘WeChat’ to contact each other online. And we share our files by using Github and Email. In case to avoid losing contact with group members, we have each others’ phone number and we can call each other anytime we need.



Skills and jobs

There are four position should be employed for the project:

1. Solutions Architect

2. Test Analyst

3. System Administrator

4. .net Engineer

The first position (Solutions Architect)

For the first position (Solutions Architect), it is a position which is look like a teamleader of the project. Solutions Architect should list the task, split the work done and give the planning for the group. Also this position should give the soulution when the other meet the problem.Usually, Solutions Architect have to know well of the marketing and understand what the prodect client want to get is. In concusion, Solutions Architect will be the leader for the project, which is look like the manager in the group.

Skill needed:

1. well know in one program language such as java,c#

2. master in database, Mysql/oracle

3. outstanding communication skill (for take order from client and spilt work to engineer)

4. enough experience as a programmer

The second position (Test Analyst)

That is easy to understand what should be done by Test Analyst. It is the position who need to find out the bug and report to the Engineer and make sure there is no error will be apper when user is using. Usually, when programmer of the group finish their part, they will send it to test Analyst. And the bug finding process will be start. If there is not any problem, it could be add to the project.

Skill needed:

1. well know in one program language such as java,c#

2. master in finding bug and bug fixing skill

3. patience and carefully

The third position (System Administrator)

This is a position which is foces on maintain the computer system and the hardware. SA should responsibility for security and documenting the configuration of the system. Because our project is belong to express industry. That is pretty important to protect the information of user. So that SA is the nesscary position of our group.

Skill needed:

1. well know as keep security of the computer system

2. master in hardware fixing

The fourth position (.net Engineer)

This is the position who is force on design and program the application for the user. Engineer will be get the work split from the Solutions Architect. And try to code the program which is going to meet the task need. This is the most basic and important position of the group.

1. Professional to use .net

2. Enough teamwork