INVESTIGATION INTO THE DRONE MARKET

Based on DJI, a Chinese drone company

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Essence of Drone

An unmanned aerial vehicle (UAV) (or uncrewed aerial vehicle, commonly known as a drone) is an aircraft without a human pilot on board and a type of unmanned vehicle. UAVs are a component of an unmanned aircraft system (UAS); which include a UAV, a ground-based controller, and a system of communications between the two. The flight of UAVs may operate with various degrees of autonomy: either under remote control by a human operator, autonomously by onboard computers or piloted by an autonomous robot.[1]

The drone is designed to do some special work that may be dangerous or hard to access for humans. Since it can be controled remotely and move in the air, if has a high flexibility.

Produce History

Oct. 2010 – first flight control unit based on GPS/INS

Dec. 2011 -Naza-M flight control unit for multirotor aircraft

Feb. 2012 – F550 six-axis flight platform

Apr. 2012 – Z15 gimble stable system for cameras

Jan. 2013 – Phantom1 the first integrated flight platform with GPS

Apr. 2014 – Phantom2 Vision integrated with gimble stabilized camera

Jul. 2014 – Ronin a professional gimble system for commercial use

Nov. 2014 – Inspire 1 professional drone with 360° changeable camera

Apr. 2015 – Phantom 3 Pro the first time take vison into control unit of drone

Jun. 2015 – M100 modular flight platform for multiple use

Nov. 2015 – MG-1 the first drone for farming

Mar. 2016 – Phantom 4 the first time use computer vision and machine learning

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Aug. 2018 – Mavic 2 Pro pocket size drone with omnidirectional visual obstacle avoidance system and 4K camera

Why We Use Drone

a. There are lots of situations or places that are inaccesible to humans. At this time, frone is a very helpful tool to use. Like detect the fire.

b. Sometimes we need some image or information from a high altitude perspective, drone is the lowest cost way to do this. Like reconstrction, city planning, film production…

c. A vision from the sky sometimes may be of great help. Under situations like tracking the criminal, rescue someone…, which is much cheaper than using a helicopter.

d. Drones will have much more industry use in the future. Like spray pesticide, power inspection, express delivery…

Competitions & Tech

a. High control distance and low latency are of great importance to a drone because sometimes the drone may be controled beyond visual range. So these are the two features that most of the drone companies empasize when they have new products. In the past most of the drone choosed to use Wi-Fi which is based on TCP/IP protocol, however Wi-Fi need to build the cnnection before it communicate, so the system may have a high latency, this is not safe for control beyong visual. So DJI brought a new way to cmmunicate between drone and the controler. They make the drone itself work like a broadcasting station and the controler like a radio, but instrad of using analog signal, they use digital signal which has a much larger band width to trasfer high definitioon images. This method make DJI's product perform much better than the other products. [2]

b. Since the drone fly in the air when it works, there may be some crash accidents if the person who control it made some mistakes. So companies committed to build a

obstacle avoidence system for the drone. The first method they came up with is to use ultrasonic sensor to detect the obstacle and made the drone stop itself. However, thanks to the huge progress of GPU and machine learning these years, DJI try to use computer vision and machine learning to find the obstacle and decide which way is the best to avoid them instead of stop. They use two cameras on one side to set up a binocular vision positioning system. This method heavily depend on the ability of iamge processing of the drone, fortunately the GPU really developed a lot these years so DJI can put this system on all six sides of the drone. This really has a huge appeal to consumers and make the best sell consumer prodects.

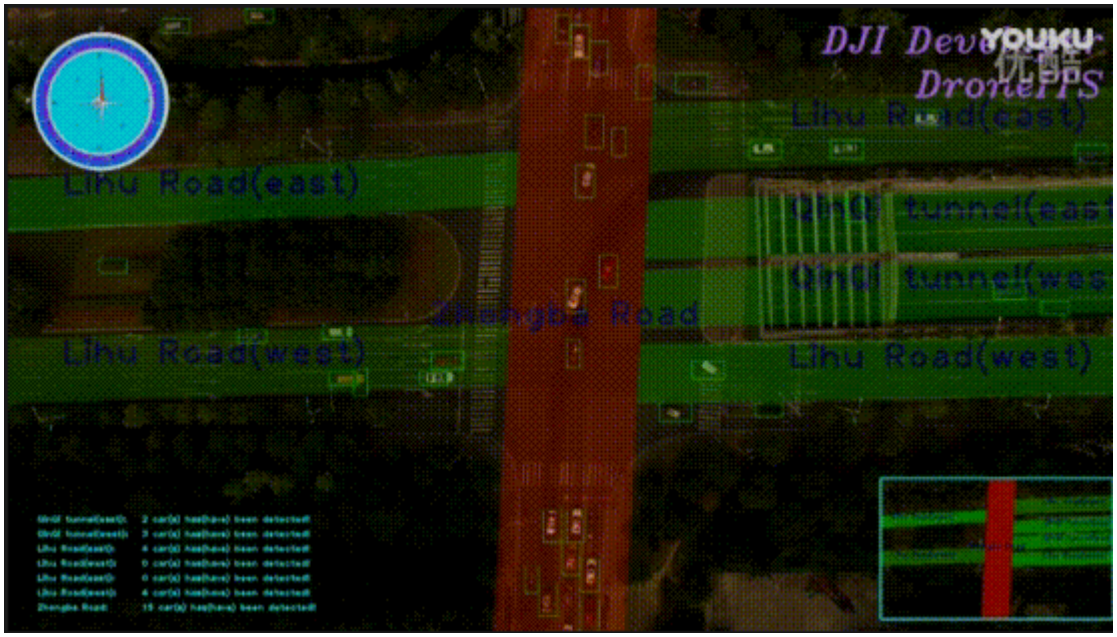
c. To most of the people, controling a drone seems to be a skillful work, so companies are trying to add some intelligent functions into the control system. DJI took advantage of the powerful GPU on the drone and developed serveral useful functions for the users. The most successful one is Active Track, that is to use contour recognition to analyze and track the body that the user

wants to track. So users don’t need to precise control the drone and focus more on the images they want to take.

About Open Source

In order to better meet the diverse needs of users, DJI set up an open source platform called DJI Developer, and released its SDK (Software Development Kit). The SDK includes the interface for both IOS/Android, flight simulator, debug tools, example code. It can be seperated into three parts Mobile SDK for app development, Onboard SDK for modular plarform, Guidance SDK for guidance system.

Over these years, developers have made lots of usedful third party programs that can make the drone do lots of automated tasks. One example is based on the advantages of the drone's perspective, according to the histogram of orientation gradient (HOG) and support vector machine (SVM), real-time statistics of traffic flow and monitoring of traffic conditions allow users to understand traffic flow information in real time through mobile phones. [3]



Reference

[1] https://en.wikipedia.org/wiki/Unmanned_aerial_vehicle

[2] https://www.dji.com/cn/lightbridge-2

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