DJI Drone

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Introduction
Welcome.
In this video we will examine how a DJI Matrice 4TD drone is used within the EagleArca platform and analyze its main technical characteristics as well as the way it integrates into the platform's operational workflows.
Today drones represent one of the most effective tools for the rapid acquisition of geospatial data and for monitoring infrastructure, territories and complex environments. Thanks to their ability to capture high resolution imagery, thermal data and precise spatial information they can support inspection, surveying and monitoring activities with very short response times.
In this video we will analyze the structure of the drone, the integrated sensors, the control and communication system used with EagleArca, the data acquisition methods and the operation of the automatic hangar used for autonomous missions.
We will conclude with some practical recommendations for maintenance and operational best practices.

Structure and Mobility
The drone used in this system is the DJI Matrice 4TD, a professional UAV platform designed for monitoring operations and data acquisition in complex operational environments. The drone weighs approximately 1850 grams in operational configuration with the battery installed. The maximum takeoff weight, which represents the total allowable weight including any additional payload, is approximately 2090 grams.
The propulsion system consists of model 2611 motors paired with model 1364F foldable propellers, which are designed to reduce noise and improve aerodynamic efficiency. The propellers also include anti icing features that allow the drone to operate even in colder weather conditions.

When fully loaded the drone can reach approximately 47 minutes of flight time at a speed of 15 meters per second. In an operational scenario with a mission radius of up to 10 kilometers it is possible to maintain about 18 minutes of effective operational activity before the return phase.
Power is provided by a 6768 mAh Li ion 6S battery which allows a very high flight endurance for this class of aircraft.
The drone can reach up to 54 minutes in forward flight and about 47 minutes while hovering. From an operational perspective the drone can operate within a wide temperature range, from minus 20

degrees Celsius to 50 degrees Celsius, and has an IP55 environmental protection rating that makes it resistant to dust and light rain. It is also designed to operate with winds of up to 12 meters per second both during flight and during takeoff and landing phases.
Positioning accuracy is ensured by an integrated RTK module, a satellite correction technology that improves GNSS positioning accuracy down to a few centimeters. In the case of the Matrice 4TD RTK positioning accuracy reaches approximately plus or minus 10 centimeters both vertically and horizontally.
The GNSS system uses multiple satellite constellations simultaneously including GPS, Galileo, BeiDou, GLONASS and QZSS. Using several constellations improves positioning robustness and ensures signal continuity even in complex urban environments.

Integrated Sensors

One of the most important elements of this platform is the integrated multi camera system, which is designed to capture several types of data during the same mission. The drone is equipped with four main sensors: a wide angle camera, a medium telephoto camera, a long range telephoto camera and a thermal camera.
The three visible cameras use high resolution 48 megapixel CMOS sensors with sizes between 1 over 1.3 inches and 1 over 1.5 inches. The wide angle camera has an equivalent focal length of 24 millimeters and offers a field of view of approximately 82 degrees. It is mainly used for general documentation and area mapping. The medium telephoto camera, with an equivalent focal length of 70 millimeters, allows operators to focus on specific details of the observed infrastructure or environment. The long telephoto camera, with a focal length of 168 millimeters, makes it possible to capture detailed images even at significant distances from the target. Alongside the RGB cameras the system also includes a thermal camera based on an uncooled VOx microbolometer with a resolution of 640 by 512 pixels.This type of sensor measures infrared radiation emitted by objects and allows the analysis of temperature distribution across the observed surface. Thermal images can be saved both in standard JPEG format and in 16 bit R JPEG format, which preserves more detailed thermal information for later analysis.
All cameras are stabilized by a three axis mechanical gimbal which compensates for drone movements during flight and allows stable image acquisition even in the presence of vibrations or wind. The drone supports several acquisition modes including single capture, timed capture and automatic capture during flight.

Control and Communication System

Within the EagleArca system the drone is managed through a cloud based control architecture. Flight missions are planned and configured within the platform by defining waypoints, acquisition parameters and the actions that must be executed during the mission.
Once the mission is started the drone automatically follows the programmed route and acquires data according to the defined configuration. Video communication is handled through the DJI O4 Plus Enterprise transmission system which enables real time video streaming to the control platform. This allows operators to monitor the mission in real time and verify the quality of the acquired data. System connectivity is supported by an Ethernet network capable of reaching speeds of up to 300 megabits per second, ensuring stable data transmission between the drone, the automatic hangar and the cloud platform.
For operational safety the drone is equipped with an advanced omnidirectional obstacle detection system based on binocular vision and three dimensional infrared sensors. This system allows the

aircraft to identify obstacles along its trajectory and automatically avoid them during flight.
The kit may also include an additional obstacle detection module composed of millimeter wave radar and a rotating LiDAR sensor. This module is designed to detect thin objects such as electrical wires even in low light conditions.
The drone also integrates a Return to Home function which automatically returns the aircraft to its starting point when the system detects conditions that require the mission to be interrupted, for example when the battery level becomes too low.

Data Acquisition

During operational missions the drone acquires images and data while following predefined routes. Missions are configured through waypoints which define the drone’s trajectory in space. The average flight speed used during data acquisition is generally around five meters per second, while the maximum operational speed can reach fifteen meters per second. Flight altitude depends on the type of mission.
During infrastructure inspections the drone may operate at relatively short distances in order to ensure greater precision when capturing details. During large scale territorial surveys the aircraft typically flies at higher altitudes. The system also integrates a laser rangefinder with a range of up to 1800 meters which can be used for distance measurements. In addition the platform includes an NIR auxiliary light which allows acquisition operations even in low light conditions up to approximately 100 meters.
The acquired data are stored locally on high speed microSD cards with capacities of up to 512 gigabytes and are later synchronized with the platform for analysis and result management.

Hangar

One of the key elements of the operational infrastructure is the DJI Dock 3 automatic hangar system. This device allows flight operations to be fully automated and enables the drone to take off, land and recharge without the physical presence of operators on site. The dock includes an automatic hatch opening system that allows the drone to take off when a mission is started.
At the end of the mission the drone returns automatically. The system uses a combination of RTK positioning and visual markers located on the landing platform to guide the drone precisely during the return and landing phase. Once landed the drone connects to 35 volt direct current charging contacts which allow the battery to recharge from 15 percent to 95 percent in approximately 27 minutes.
The dock also includes environmental sensors that monitor wind, rain and temperature and it can operate continuously with a high level of automation. In the event of a power outage an integrated backup battery allows the system to continue operating for more than four hours.

Maintenance and Best Practices

To ensure operational safety and the quality of the acquired data it is important to follow several maintenance best practices. Before each mission it is necessary to verify the battery status, the integrity of the propellers and the correct functioning of navigation sensors and obstacle detection systems.
It is also important to check that the surfaces of cameras and sensors are clean in order to prevent dust or moisture from affecting image quality. For systems based on automatic hangars it is essential to ensure that the dock is installed in an open area with stable power supply and reliable network connectivity.

Periodic maintenance also includes checking backup batteries, verifying electrical protection systems and updating device firmware when necessary.

Conclusion

In this video we examined the structure of the DJI Matrice 4TD aircraft and reviewed the sensors used for data acquisition. We also analyzed the control and communication system, the methods used for collecting operational data and the operation of the automatic hangar that enables autonomous and continuous missions.

Thanks to the integration between the drone, the charging infrastructure and the cloud platform EagleArca makes it possible to manage automated data acquisition missions while improving operational efficiency and strengthening the ability to monitor infrastructure, territories and complex environments.

See you in the next video.

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