Robot Dog GO2 & DJI Matrice 4TD Drone

Robot Dog GO2

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Introduction

Welcome.

In this video we will look at an overview of the GO2 quadruped robot and how it is used in surveying, inspection, and data acquisition activities integrated with the EagleArca platform.

The GO2 is a mobile robot designed to operate in complex environments or situations that may be potentially dangerous for human operators. Thanks to the combination of advanced mobility, integrated sensors, and real-time communication systems, the robot can explore an environment, collect data, and transmit it directly to the digital platform that manages the operations.

Throughout this video we will see how the robot is structured, which sensors it uses to perceive the surrounding environment, how communication with the platform takes place, and how operational missions can be planned through the Mission Planner features of EagleArca, which allow users to define routes, actions, and data acquisition activities.

We will also see how the robot can be equipped with additional tools to adapt to different operational scenarios, and we will conclude with some practical guidelines for system maintenance and management.

Structure and Mobility

The GO2 is a quadruped robot, meaning a robotic platform that moves using four articulated limbs similar to the legs of an animal. This type of architecture provides much greater mobility than wheeled or tracked robots, because it allows the system to handle uneven surfaces, overcome small obstacles, and maintain stability even on complex terrain.

The robot’s structure is designed to be both lightweight and durable. The frame uses high-strength metal materials that keep the overall weight relatively low while maintaining the robustness required for operation in demanding environments.

Each leg of the robot is composed of multiple motorized joints that allow the system to continuously adapt its posture and gait depending on the surface it moves across. These joints form the robot’s degrees of freedom, meaning the directions in which the robot can move its limbs.

Thanks to this system, the GO2 can walk, climb small steps, move across irregular terrain, and maintain balance even while in motion. The motion control systems constantly work to stabilize the robot and adjust its posture whenever the terrain changes suddenly.

These characteristics make the robot particularly suitable for inspection activities in industrial environments, infrastructures, construction sites, or natural areas where human access may be difficult or risky.

Integrated Sensors

In order to orient itself in space and collect useful information during a mission, the robot is equipped with several integrated sensors that allow it to perceive the surrounding environment.

Among the main ones are RGB cameras, which capture color images in the visible spectrum, similar to those used in standard digital photography systems. These cameras allow the robot to visually document the environment and acquire images useful for inspection and monitoring activities.

Alongside RGB cameras there are often depth cameras, which are sensors capable not only of capturing an image but also estimating the distance of objects within the scene. This makes it possible to reconstruct the geometry of the surrounding environment.

Another fundamental sensor is LiDAR, which stands for Light Detection and Ranging. LiDAR is a scanning system that uses laser pulses to measure the distance between the sensor and surrounding objects. By analyzing the time it takes for the laser beam to return, the system can calculate distances with high precision and generate a three-dimensional representation of the environment.

The robot also integrates an IMU, or Inertial Measurement Unit. This sensor detects accelerations, rotations, and inclinations of the robot, allowing the control system to maintain balance and stability during movement.

In some configurations, GPS or RTK positioning systems may also be present. GPS allows the robot to determine its position on the Earth’s surface, while RTK (Real-Time Kinematic) technology significantly improves positioning accuracy, reaching centimeter-level precision.

All these sensors work together to allow the robot to understand the surrounding environment, avoid obstacles, and move safely during operations.

Communication and Network

During operations, the robot must be able to continuously communicate with control and supervision systems.

For this reason, the GO2 uses several network communication systems, including Wi-Fi and cellular connectivity, allowing the robot to transmit data and receive commands in real time.

Through these connections, the robot can send sensor information, camera images, and telemetry data to the platform. Telemetry refers to the set of data that describes the operational state of the system, such as position, speed, battery level, and sensor status.

When the robot is connected to the EagleArca platform, this data is visualized and managed within the operational environment. Operators can therefore monitor the mission status, observe the collected data, and intervene if necessary.

This continuous connection transforms the robot from a simple mobile device into an integrated component of a broader digital system, where data acquisition, monitoring, and analysis all take place within the same platform.

Add-ons and Payload

One of the most interesting aspects of the GO2 is the possibility of installing modular add-ons.

The term add-on refers to any additional tool or sensor installed on the robot to perform a specific operational task. The payload represents the maximum useful load that the robot can carry.

Among the most common add-ons are high-resolution cameras for visual documentation, three-dimensional LiDAR scanners for environmental mapping, and multispectral sensors used for environmental or agricultural analysis.

A multispectral sensor is a particular type of sensor capable of capturing images in multiple bands of the electromagnetic spectrum, not only within the visible range. This allows the analysis of environmental characteristics that would not be visible with a standard camera.

When the robot is used together with EagleArca, the robot’s hardware configuration is registered within the platform. The Mission Planner features allow users to define the Mission Unit, meaning the specific robot used for the mission, and the add-ons installed on it.

This step is important because it allows the platform to know which instruments are available during the mission and therefore which operations can be performed along the route.

Control and Navigation

The robot can be controlled either in manual mode or in autonomous mode.

Manual control can be performed using the robot’s dedicated controller or directly through the EagleArca platform. When the robot is executing an automatic mission planned within the platform, the operator can suspend the automatic execution at any time and take manual control of the robot through the EagleArca interface.

Autonomous mode, on the other hand, derives from mission planning using the Mission Planner features.

Within the platform it is possible to draw on the map the route that the robot must follow. This route is defined through a sequence of waypoints, which are geographic points representing the stages of the robot’s movement.

Each waypoint can include one or more operational actions, such as capturing images, starting a scan, or executing a pause.

Once the mission is configured, the platform performs a preliminary verification called Mission Pre-Check, which verifies the availability of the robot, configured sensors, and the parameters required for mission execution.

After this verification the mission can be launched, and the robot will autonomously follow the defined route.

Data Acquisition

During mission execution the robot performs data acquisition activities along the defined route.

Acquisition operations are configured during mission planning. At each waypoint it is possible to define specific actions that the robot must perform, such as taking photos, recording video, or starting a scan with the installed sensors.

This allows the creation of operational missions in which the robot does not simply move through space but performs a sequence of data collection activities.

The data acquired during the mission is transmitted and stored within the EagleArca platform. Each executed mission is saved in the system history, allowing users to review the results, compare acquisitions over time, or repeat the same mission with identical configurations.

In this way the robot becomes part of a digital workflow that integrates data acquisition, storage, and analysis.

Maintenance and Best Practices

To ensure reliable operations it is important to follow some best practices in managing the robot.

One of the most important aspects is battery management. The GO2 uses a dedicated battery with an integrated management system that automatically controls charging and discharging operations and protects the system from overvoltage or electrical anomalies.

The battery level can be checked using the LED indicators located on the battery itself. These indicators show the remaining charge percentage and help determine when the system needs to be recharged.

Charging must be performed using the dedicated charger provided by the manufacturer. Before connecting the charger, it is necessary to ensure that the battery is turned off and disconnected from the robot. During charging, the LED indicators show the status of the process until the battery is fully charged.

During operation it is also important to pay attention to the status lights on the robot, which communicate the operational state of the system. A green light generally indicates that the robot is powered on and operational, while other color combinations or flashing signals may indicate specific modes, sensor calibration, low battery, or possible system anomalies.

Before starting a mission it is also recommended to verify the sensor status, network connection, and mission configuration within the platform.

Another important aspect concerns firmware updates, which are updates to the internal software that manages the robot's operation. Keeping the firmware updated helps improve stability, security, and system performance.

By following these procedures it is possible to ensure safer operations and greater reliability of the robot during surveying and monitoring activities.

Conclusion

In this video we have seen an overview of the GO2 quadruped robot and its main operational characteristics.

We examined the robot's structure and locomotion system, the sensors that allow it to perceive the surrounding environment, and the communication systems that enable the transmission of data and information in real time.

We also saw how the robot can be equipped with different add-ons to adapt to various operational scenarios, and how the Mission Planner features within EagleArca allow users to plan missions, define routes, and manage data acquisition activities directly from the platform.

Thanks to the combination of advanced mobility, sensor technology, and software integration, the GO2 represents a versatile tool for surveying, monitoring, and inspection activities in complex environments.

Integration with EagleArca also allows robotic operations to become part of a complete digital workflow, where mission planning, data acquisition, and information analysis are all managed within the same system.

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.