Professional Certificate in Artificial Intelligence for Mineral Exploration

Robotics for Field Surveys

Robotics for Field Surveys: Key Terms and Vocabulary

In this Professional Certificate course on Artificial Intelligence (AI) for Mineral Exploration, we will cover Robotics for Field Surveys. This module will introduce you to various key terms and vocabulary related to robotics, drones, and unmanned aerial vehicles (UAVs) used in field surveys. This comprehensive glossary will help you understand the concepts, examples, practical applications, and challenges in this field.

1. Robotics
Robotics is a branch of engineering and computer science that deals with designing, constructing, and operating robots. These machines replace humans in performing tasks that are dangerous, difficult, or repetitive. Robots can be autonomous or semi-autonomous and are used in various industries, including mineral exploration.
2. Drone
A drone is an unmanned aerial vehicle (UAV) that can be controlled remotely or fly autonomously using software-controlled flight plans. Drones are equipped with sensors, cameras, and other payloads to collect data and perform tasks in various industries, including mineral exploration.
3. Unmanned Aerial Vehicle (UAV)
An Unmanned Aerial Vehicle (UAV) is an aircraft without a human pilot onboard. UAVs can be controlled remotely or fly autonomously using software-controlled flight plans. Drones are a type of UAV used for various purposes, including aerial photography, surveying, and mapping.
4. Autonomous
Autonomous refers to a system or device that can operate independently without human intervention. In robotics, autonomous systems can make decisions based on sensor data and pre-programmed instructions.
5. Sensor
A sensor is a device that detects changes in the environment and converts them into electrical signals. Sensors are used in robotics and drones to collect data about the environment, such as temperature, humidity, and location.
6. Global Positioning System (GPS)
GPS is a satellite-based navigation system that provides location information to GPS receivers. GPS is used in robotics and drones to determine their location and navigate to specific coordinates.
7. Light Detection and Ranging (LiDAR)
LiDAR is a remote sensing technology that uses laser light to measure distances to objects. LiDAR is used in robotics and drones for 3D mapping, surveying, and object detection.
8. Inertial Measurement Unit (IMU)
An IMU is a device that measures acceleration, angular velocity, and magnetic field strength. IMUs are used

in robotics and drones for navigation, stabilization, and orientation.
9. Geographic Information System (GIS)
GIS is a system that captures, stores, analyzes, and visualizes geographic data. GIS is used in mineral exploration to create maps, analyze spatial data, and make informed decisions.
10. Multi-rotor
A multi-rotor is a type of drone that uses multiple rotors to generate lift and propulsion. Multi-rotors are commonly used for aerial photography, surveying, and mapping.
11. Fixed-wing
A fixed-wing is a type of drone that uses wings to generate lift and propulsion. Fixed-wing drones are commonly used for long-range surveys, mapping, and inspections.
12. Payload
A payload is the cargo or equipment carried by a drone or robot. Payloads can include cameras, sensors, and other tools used for data collection and analysis.
13. Flight Time
Flight time is the duration a drone can stay in the air before needing to recharge or refuel. Flight time is an essential factor in selecting the right drone for a specific task.
14. Return to Home (RTH)
RTH is a feature in drones that allows them to return to their starting point automatically. RTH is useful in case of signal loss, low battery, or other emergencies.
15. Obstacle Avoidance
Obstacle avoidance is a feature in drones that allows them to detect and avoid obstacles in their path. Obstacle avoidance is essential for safe and efficient flight in complex environments.
16. Orthomosaic
An orthomosaic is a geometrically corrected image mosaic created by combining multiple aerial images. Orthomosaics are used in mineral exploration for mapping and analyzing geological features.
17. Digital Surface Model (DSM)
A DSM is a 3D model of the Earth's surface created using LiDAR or photogrammetry. DSMs are used in mineral exploration for topographic analysis and volumetric calculations.
18. Digital Elevation Model (DEM)
A DEM is a 3D model of the Earth's surface that represents the height of the terrain above or below a reference surface. DEMs are used in mineral exploration for geomorphological analysis and watershed modeling.
19. Structure from Motion (SfM)
SfM is a photogrammetry technique that uses multiple overlapping images to create a 3D model. SfM is used in mineral exploration for creating 3D models of geological features.
20. Magnetometer
A magnetometer is a device that measures the magnetic field of the Earth. Magnetometers are used in mineral exploration for detecting magnetic anomalies associated with mineral deposits.

In conclusion, this glossary provides a comprehensive overview of the key terms and vocabulary related to

robotics for field surveys in the Professional Certificate course on Artificial Intelligence for Mineral Exploration. Understanding these concepts will help you apply robotics and drones to mineral exploration and make informed decisions about data collection and analysis.

Example:
In a mineral exploration project, a geologist can use a drone equipped with a magnetometer and a high-resolution camera to survey a prospective area. The drone can fly autonomously using software-controlled flight plans and collect georeferenced data using GPS and IMU. The data can be processed using GIS and photogrammetry techniques to create 3D models and maps of the geological features. The magnetometer data can be used to detect magnetic anomalies associated with mineral deposits, and the high-resolution images can be used for visual inspection and analysis.

Practical Application:
Robotics and drones are becoming increasingly popular in mineral exploration due to their ability to collect high-quality data efficiently and cost-effectively. By understanding the key terms and vocabulary related to robotics for field surveys, geologists can apply these technologies to their projects and make informed decisions about data collection and analysis.

Challenge:
One of the challenges in using robotics and drones in mineral exploration is ensuring the accuracy and reliability of the data. Geologists need to validate the data using ground-truth measurements and ensure that the sensors and equipment are calibrated correctly. Additionally, geologists need to comply with regulations related to drone flights and data privacy.