dfki ai
Deutsches Forschungszentrum
für Künstliche Intelligenz
German Research Center for
Artificial Intelligence

Coyote 3

Scout Micro Rover

Photo: Raúl Domínguez, DFKI

System Description

Coyote 3 is a micro rover designed for high mobility performance in unstructured terrains and reduced energy consumption. Equipped with its own power source, on-board sensor suite and computer it can perform autonomous exploration tasks.

Coyote 3 is equipped with one standardized Electro-Mechanical Interface (EMI), allowing to dock additional payload elements, such as a manipulator or a sensor module. While lightweight, the robust structural design of Coyote 3, allows it to transport several kilograms of additional payload. The system wheels can easily be replaced depending on the scenario of application.

The rover can estimate its pose thanks to its 5 encoders and IMU. It also perceive its surroundings through two RGB + TOF cameras and solid state lidar. These sensors are used to provide the rover with autonomous navigation capabilities. Furthermore, a sensor module mounted on the end of its articulated arm can provide close-range 3D and hyper-spectral data. The full set of sensors can be used to identify resources autonomously.

Coyote 3 has participated in several field test and demonstrated excellent robustness traversing rough surfaces such as cliffs or crater rims. Furthermore, the system autonomously rappelled down though a ground hole to enter a subterranean lava tube supported by the larger rover SherpaTT.

Technical Details

- **Size (l x w x h)**: 994 x 584 x 380 mm
- **Mass**: 12.5 Kg (excl. Payloads)
- **Payload Capacity**: 10 – 15 Kg
- **Locomotion**: 4-Wheel drive. Robodrive ILM 50x08 bldc-motor with Harmonic Drive gearing (80:1)
- **Wheel torque**: 22.4 Nm (nominal)
- **Speed**: 1.3 m/s
- **Sensors**:
  - Solid State Lidar: Velarray M1600
  - RGB + TOF Cameras: Vzense DCAM650C ToF
  - IMU and GPS: XSens MTi-680G
  - Absolute wheel encoders
- **On board computer**: IntelCore i7-3517UE, 1.7 GHz
- **Communications**: 2.4 GHz, 802.11n mobile access point
- **Power supply**: LiPo 44,4 V; 4,5 Ah
- **Power consumption**: ~ 75 W (average)
- **Structure**: CFRP based semi-monocoque housing paired with lightweight aluminium

Field Tests

Rappelling into a lava tube with rugged methalic wheels, tethering module, ground penetrating radar and a computing payload (Photo: Meltem Fischer)

Climbing a steep slope in the Utah desert (Photo: Roland Sonsalla)

Coyote 3 on a Volcanic environment and in the Utah desert (Photos: Raúl Domínguez and Florian Cordes)

Applications Space Robotics, Search and Rescue

Projects

PERSIM
Robust autonomous exploration algorithms for robotic planetary prospection.

(07/2022 – 12/2024)

Rob-X
Cooperative Robots for Extreme Environments: exploration of planetary surfaces, with a focus on hard-to-reach areas.

(03/2021 – 2/2023)

Trans TerrA
Semi-autonomous cooperative exploration of planetary and terrestrial applicability of individual aspects.

(05/2013 – 04/2017)

Contact:
DFKI GmbH & University of Bremen
Robotics Innovation Center

Director: Prof. Dr. Frank Kirchner
Phone: +49 421 – 178 45 4100
E-mail: robotik@dfki.de
Website: www.dfki.de/robotics