

Asguard v4

Mobile Scout Rover



Photo: Thomas Frank, DFKI

System Description

Asguard v4 is a versatile wheel-leg hybrid rover which can be used to navigate in unstructured environments, including harsh ones like lava caves for multiple hours without external power supply. Its hybrid wheel-legs are conceived to facilitate the locomotion over obstacles as well as stairs. Nevertheless, these can also be swiftly replaced for normal wheels.

The base system is equipped with an on-board PC, which is normally used to process sensor data and run the autonomous navigation or remote-control algorithms. The base includes encoders in each of the 5 joints and an IMU which allows the system to self-localise. Furthermore, the powerful motors allow the system to carry payloads of multiple kg in mass.

Connected to the base through a DFKI's standard Electro-Mechanical Interface (EMI) a sensor payload provides the environment data. The sensor payload is composed of a 360° Laser-Range-Finder, a 360° camera system and lights. With these additional device the rover can produce maps, improve its pose accuracy and use these data products to navigate autonomously. Nevertheless, the system can also be tele-operated via videolink while providing a full view of the surroundings. Finally, the EMI allows the module to be easily replaced for other payloads tailored to specific applications.

Field Tests



Asguard v4 navigates through steep slopes and harsh surfaces in a lava tube.
(Photo: Raúl Domínguez, DFKI GmbH)



Tests with standard wheels at the Federal Agency for Technical Relief
(Photo: Florian Cordes, DFKI GmbH)

Technical Details

- **Dimensions:** 0.935 m x 0.56 0m x 0.5 m
- **Weight:** 16 kg
- **Payload capacity:** 5 kg
- **Runtime:** ca. 3 h
- **Actuators/Motors:** 4 x DC-Motor Faulhaber 3863 024 CR + planetary gear 66:1
- **Sensors:**
 - 360° Laser Scanner Velodyne 32 Lidar
 - Stereo camera with 2 Entaniya Fisheye 220
 - IMU Xsens Mti-28A53G35
 - Optical incremental Encoder Agilent AEDB-9140
 - (Optional) GPS with RTK correction
- **Communication:** Mobile Router ASUS WL-330N3G
- **Computer:** Embedded PC Quad Core i7



Traversing a tube and moving over rocks on a volcano including the GPS module
(Photos: Florian Cordes and Raúl Domínguez, DFKI GmbH)

Applications

Space Robotics, Search and Rescue & Security

Projects



Robust autonomous exploration algorithms for robotic planetary prospecting.

(07/2022 – 12/2024)



Complex systems enabled with Explainable Artificial Intelligence to assist in the monitoring of space missions.

(12/2020-06/2023)

Entern

Improve the autonomous capabilities of autonomous robots in difficult situations such as craters and caves.

(01/2014 – 12/2017)