

CREX

A Walking Robot for Lunar Crater Exploration

System Description

The robot CREX (Crater Explorer) is a six-legged walking robot, that is based on the developments in the project SpaceClimber. In the project RIMRES CREX acted as a scouting system. The robot is intended to explore the inner of deep lunar polar craters in search for water ice or other volatile substances.

Via the electro-mechanical interface on CREX' back, the robot can be connected to the Sherpa rover for travelling longer distances. Furthermore, an expansion of the system's capabilities is possible with the EMI: Additional battery modules or scientific instruments can be docked to the interface.

Technical Details

- **Size:** 0.82 m x 1 m x 0.22 m (normal posture)
- **Weight:** 27 kg
- **Speed:** max. 0.12 m/s
- **Payload:** max. 10 kg
- **Runtime:** approx. 1h w/o payload (2400 mAh battery)
- **Actuation/Engine:** 24 joints in 6 legs + 1 body joint (RoboDrive + HarmonicDrive), 2 Servo motors (Dynamixel) for head control
- **Sensors:** 1x Prosilica camera, 1x Hokuyo Laserscanner, 1x IMU, per leg: 6-DOF force-torque, current measurement, battery voltage; per joint: current measurement, voltage measurement, rotational speed, position (absolute and incremental), temperature; per foot: 4x pressure for deformation measurement, 3-axis acceleration measurement, optical encoder for immersion of spring element in lower leg, ADC for 4x strain gauges usable, e.g. for bending measurement of optional claws
- Electro-mechanical interface (EMI) for tight connection to Sherpa in the project RIMRES; the interface is part of a power management system and allows energy and data exchange between coupled systems
- A Pico-ITX Board with Intel Atom 1.6 GHz, 256 GB SSD, for control of the robot is located in the robot's front body
- The robot's head embodies a swivel-mounted camera and a vertically aligned laser scanner to map its environment
- Walking patterns are computed and controlled via a FPGA board Suzaku S, which communicates via LVDS with the robot's legs
- The robot receives its mission tasks via a wireless connection. Each task can be performed autonomously or manually controlled by an operator



Application: Space Robotics

Projects:

ENTERN
Environment Modelling and Navigation
for Robotic Space-Exploration
(10/2014 - 09/2017)

RIMRES
Reconfigurable Multi-Robot
Exploration System
(09/2009 - 08/2012)

