MANTIS
Manipulation and Locomotion System

System Description

MANTIS is a multi-legged robot with six extremities. The system was developed as a platform for interdisciplinary research in the area of mobile manipulation with multi-legged robots. To fulfill a variety of different tasks the robot is capable to operate in two different postures. In the manipulation posture MANTIS uses the four rear legs for locomotion and the two front legs for manipulation. Furthermore, the robot is capable to walk on all six extremities, which is a big advantage in difficult terrain. This flexibility allows to solve complex scenarios with only one system. Several software components as well as the planning can be evaluated within such scenarios.

Technical Details

- **Size:** 2.96 m x 1.84 m x 0.32 m
- **Weight:** ca. 107 kg
- **Runtime:** ca. 40 min
- **Speed:** ca. 3.6 km/h
- **Degrees of Freedom (61-DOF):**
  - Legs: 4 x 6-DOF
  - Arms: 2 x 6-DOF
  - Hands: 2 x 8-DOF
  - Torso: 5-DOF
  - Head: 4-DOF
- **Actuation:**
  - Brushless DC motors with Harmonic Drive gear
  - DC motors with planetary gear
- **Stereo camera system:** Two Prosilica GC2450C cameras in the head
- A periodically-tilting and long-ranging Hokuyo UTM for distances up to 30 m which can be exchanged by a Mesa SR-4000 3D Time-of-Flight (TOF) camera
- **Control Unit:** Mini ITX Board Core i7 and Xilinx Zynq-based main computer for communication with the periphery as well as central data fusion and pre-processing
- **Communication Network:** Consists of independent LVDS chains for the control of the two arms, the four legs, torso and head
- **Network:** Gigabit-Ethernet routed through a five-port switch connects head cameras, computer, laser scanners, and outside world
- **Force-Torque Sensor:** Between arms and gripper and between legs and feet
- **Tactile Sensors:** In the finger tips and the palm of the hands as well as pressure sensors in the sole of the feet

Application: Space Robotics, SAR and Logistics

Projects:

D-Rock
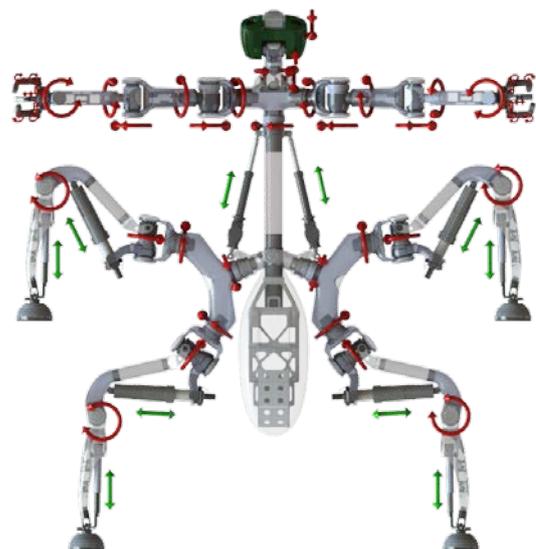Models, methods and tools for the model based software development of robots
(06/2016 - 05/2018)

LIMES
Learning Intelligent Motions for Kinematically Complex Robots for Exploration in Space
(05/2012 - 07/2016)

BesMan
Behaviors for Mobile Manipulation
(05/2012 - 07/2016)

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