

Digital Product Memory Supports Dual-Arm Manipulation



Mobile Dual-Arm Manipulation and Digital Product Memory Improve the Autonomy of Decentralized Object Handling

With the aid of a digital product memory attached to the product, the mobile autonomous dual-arm AILA robot will adapt the grasping and transport behaviours to the object to be handled.

The latest version of the robot (named AILA) consists of a complete anthropomorphic upper body mounted on a wheeled mobile platform. The upper body consists of two arms, each of them with seven degrees of freedom, a torso with four joints, and a head with two degrees of freedom. The robot's hardware include:

- a stereo camera in the head as well as a 3D-camera on the torso used for object and scene recognition, and pose estimation
- two computers for vision processing and motion control, one located in the head and one in the torso
- the "nervous system" consists of three independent CAN-lines for communicating with the arms and torso, GigaEthernet connection for the stereo camera, and RS-485 for the servos moving the pan-tilt unit on the head.

An RFID-antenna integrated inside the left hand enables the robot to communicate with the digital product memory in order to obtain information regarding size, weight, and lifting points of the considered object as well as to store in it a summary of the handling operations performed.

The mobile platform consists of six wheels with two degrees of freedom each, one for the steering axis and one for driving the wheel. These are controlled by two independent CAN-lines. The steering axis can be positioned in any direction, making the mobile platform extremely versatile – it can navigate autonomously in slightly rough indoor environment because each pair of wheels is connected with the platform through a non-actuated rotary axis. Two laser scanners monitor the environment, recognize the relevant working area and therefore support a precise approach towards the objects to be handled.

Size 1.15 x 0.75 x 1.70 m (L x W x H)

Motors

- 2 x 7-DOF Arms with Payload / Weight > 1
- 4 DOF Torso
- 12 DOF Mobile Platform

Sensors

- Skyetek M4 RFID Module
- 2 x Prosilica GC780C Camera
- Mesa SR-4000 3D Camera
- Hokuyo URG Laserscanner
- 2 x Hokuyo UTM Laserscanner

SPONSORED BY THE



**Federal Ministry
of Education
and Research**

Semantic Product Memory – Products Keep a Diary
Support programme: BMBF IKT 2020
Support code: 01IA08002
Duration: 01.02.2008 – 31.01.2011
www.semprom.org

Contact:
DFKI Bremen
Robotics Innovation Center

Director: Prof. Dr. Frank Kirchner
E-mail: robotics@dfki.de
Website: www.dfki.de/robotics