SCITOS G5 –
A mobile platform for research and industrial applications
Agenda

1. Products for Advanced Robotic Research
2. Software architecture
3. Applications
Main products from MetraLabs

SCITOS G5  Human-Machine-Interface  RoboHead  Mobile manipulator

More than 45 robots based on the SCITOS G5 architecture are sold until today.
SCITOS G5 is the technological base for our service robot applications.

**SCITOS G5**

- Differential drive with two high torque EC gear-motors
  - 582 mm x 737 mm x 617 mm (H x L x W)
  - velocity: ca. 1 m/s
  - payload: 50 kg
- Battery 24 V, 40 – 80 amp-hours (8-20 hours autonomous usages), optional lithium-polymer-technology, docking station
- Collision and sonar sensors
- Localization module with compass and RFID-antenna
- Integrated battery charger
- Integrated industrial Embedded PC with Intel Core™ 2 Duo or Intel Core™ i7 technologies
- CANOpen, Ethernet, WiFi, USB
- OS Linux (Fedora 12)
In combination with several sensors and add-ons many applications are possible.

**Products for Advanced Robotic Research** | Software | Applications

- Guiding people
- Video consulting
- Introducing new products
- Couponing
- Price scanning
- Sales promotion

- Human-Robot Interaction
- Navigation
- Obstacle avoidance
- Mobile manipulators

- Flexible autonomous transports of e.g. chemical samples, circuit cards
- Mobile manipulators
- Suitable for cleanrooms

Ready for an everyday usage in...

**Stores & Museum**

**Science**

**Industries**
SCITOS A5 Overview

- Autonomous movements to target points within the known environment of the robot.
- Autonomous obstacle avoidance
- Speech synthesis based on Loquendo: up to 25 languages, male/female voice.
- Height: ca. 150 cm, diameter: ca. 60 cm, weight: 75 kg
- Runtime: ca. 8 h / charging time: ca. 8 h
- Main sensors: laser, sonar and frontal camera
- Tested and certified by the German TÜV
SCITOS A5 AT A GLANCE

Display module:
- 15.4" TFT with touch
- stereo speakers
- microphone
- bar code scanner
- RFID administration reader

Control module:
- motor electronic unit
- sensor electronic unit
- industrial embedded PC (Intel Core Duo, 2.0GHz, 2 GB RAM, WiFi)
- including: Exclusive software modules for navigation, localisation, obstacle avoidance and people tracking; developed at the Ilmenau University of Technology

Driving module:
- 2 high torque motors
- 3 wheels
- batteries (lead-acid, 24V)
- charging electronic unit

360° camera system
→ Detection of the user
( optional )

Unique robot head with 6 degrees of freedom
→ interaction with the user

Plastic enclosure
(your choice of colour and branding)

Obstacle detection and navigation sensor system:
- Frontal camera
- Safety laser range finder
- 24 ultrasonic sensors
→ obstacle detection

Collision sensor
→ stop in case of collisions

Contacts for automatic charging (optional)

RFID floor antenna
Charging connector (230 VAC)
CogniDrive is an autonomous navigation software for public environments.

Products for Advanced Robotic Research | Software | Applications

CogniDrive

Laser-Mapping

Localization

Obstacle avoidance

Path planning
CogniDrive

- Various drive systems, adaptive motion model
- Non-holonomic shape systems
- Consideration of the real shape of the vehicle for the path planning
- Visual obstacle detection
- Special maps and traffic rules
  - No-Go-Areas: forbidden for the vehicle
  - Speed areas: limited speed in certain areas
  - One way roads / right, left
- Consideration of the vehicle’s dynamics
- Smooth acceleration and deceleration
- Path planning, dynamic obstacle avoidance, dynamic re-planning
- Path following
- Precise navigation by using laser and vision templates
1. Products for Advanced Robotic Research
2. **Software architecture**
3. Applications
MetraLabs uses a 4-layered software architecture.

**Application layer**
- Graphics User Interface
- Databases

**Behaviour Layer**
- Script Language
- Behaviours

**Skill Layer**
- Localization
- Navigation
- People Tracking
- SCITOS driver
- Camera drivers

**Low level basic layer**
- Robot Hardware
- Operating System

A user specific GUI, connection to external databases, …

A script language based layer realizing *behaviours* and the parts of the *application*.

The *skills* of the robot: collision avoidance, localization, path planning, people tracking, …

The *framework* and *communication* interfaces. Common data types. Drivers for different sensors and robot components.

The low-level *basics*.

Parts of the skill layer are developed together with

**Neuroinformatics and Cognitive Robotics Lab**

Ilmenau Technical University

robots that inspire.
The software supports different hardware and other robot software toolkits.

Products for Advanced Robotic Research | Software | Applications

SICK laser range finders
- SICK LMS/PLS, S300, S3000

LEUZE laser range finders
- Rotoscan RS4

HOKUYO laser range finder
- URG-04LX

Cameras
- DC1394, V4L, V4L2, DFG1394, GigE
- Interface for Sony RPU cameras

Manipulators
- SCHUNK manipulator modules

Others
- CAN Bus interface, Serial interfaces

Compatibility:

Interfaces to other robot software toolkits like ROS and Player are available.
Agenda

1. Products for Advanced Robotic Research
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SCITOS A5 as a shopping robot

- Guiding customers to the product what they are look for
- Guiding customers to promotional items
- Mobile price information
- Introduction of new products:
  - Voice
  - Pictures
  - Videos
- Mobile couponing
- Commercials
A mobile robot measures clean room parameters in a Class-1 clean room at Infineon Technologies.

Mobile Monitoring

- A combination of
  - Robot platform SCITOS G5
  - Navigation software CogniDrive
  - Measurement devices
  - Controlling application

- Possible applications
  - Early detection of errors
  - Conformance to legal regulations
  - Expensive measurement devices

- Works 24h per day, 7 days per week.
The mobile robot AMOR creates a daily contamination map of the clean room.

Past: 75 measurements/month (manually)

Now: 75 measurements/day

Driven distance during the monitoring (since 04/2009): 1.800 km
Thank you for your attendance.

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