LAAS Days
Research & Technology

The LAAS robotics platform

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Laboratoire d'**A**nalye et d'**A**rchitecture des **S**ystèmes

Total staff: 600 - researchers: 450 - Engineers/support: 150

Eight research departments:

- Crucial Computing
- Networks and Communication
- **Robotics**
- Decision and Optimization
- Energy Management
- Technology and Instrumentation for the Monitoring of Complex Systems
- Micro Nano Bio Technologies
- Microwaves and Optics: from Electromagnetism to Systems

Organization of technical staff at LAAS

3 technical services:

- TEAM - Techniques et Équipements Appliqués à la Micro-Électronique
- **I2C** - Instrumentation Conception Caractérisation
- **IDEA** - Informatique Développement Exploitation Assistance

Platforms:

- Micro and nano technologies (TEAM)
- Characterization (I2C)
- Network (IDEA)
- Bio Characterization (I2C)
- Design (I2C/IDEA)
- **Robots (I2C/IDEA)**

Driven by steering committees associating Researchers and Engineers.

Robotics platform

Experimental facilities of the robotics theme.

- Two equipped experimental halls
  - motion capture, apartment model, drone arena, safety devices,...
  - 3 humanoid robots,
  - 5 indoors wheeled robots w/arms
  - 3 outdoors exploration robots
  - several drones.
- Software environment

Links with other platforms (Robotex, 2RM, Terrinet,...)

Role of the platform

- Equipment, production, maintenance, training
- Need for reactivity and sustainability
- Various areas of expertise:
  - mechanics
  - electronics
  - computer science
  - embedded systems
- Funding of large equipments by the research teams
- Operating budget (maintenance / troubleshooting, small equipments)

The “robots-admin” team

- 2 research engineers in electronics
- 4 research engineers in computer science
- support from technical workshops (electronics and mechanics)
- + contributions from PhD students and post-docs.

Current robots

HRP-2

Pyrène

Mana

ART

Jido

Mummer

Minnie

Max

Bob

Momo

Other equipments

- Motion capture systems
- Crane (safety for humanoid robots)
- Reference station for centimetric Global Positionning System
- Kuka Light Weight Robotics arms
- Dedicated network and Wi-Fi environment
- Ambiant cameras and 3D sensors
- Large display screens
- 3D printer
- ...

Software Environment

GNU/Linux systems, C & C++, python languages

Tools: Tcl/Tk, OpenCV, boost, ROS, gazebo, Matlab, git, redmine...

Developed at LAAS:

- *General:* Genom3, OpenPRS, Morse, Robotpkg
- *Humanoid robots:* Humanoid Path Planner, Stack of Tasks, Pinocchio
- *Human/Robot Interaction:* HATP, FAPE
- *Aerial Robots:* Telekyb3

→ `http://www.openrobots.org/`

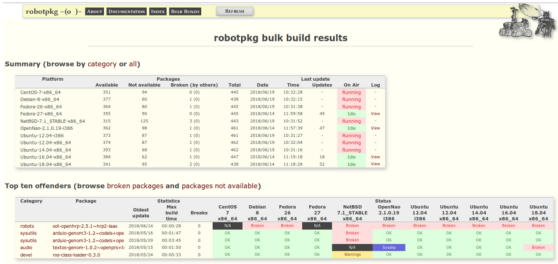
Operation

- Meetings:
  - Technical (robots-admin + users): 1 per month
  - Steering committee (Team Managers + platform representatives): 1 per year
- Mailing-lists:
  - `robots@laas.fr`: direct exchanges between all users
  - `robots-admin@laas.fr`: support requests to the platform team
- Intranet wiki: `https://wiki.laas.fr/robots/`
- Free software distribution `http://www.openrobots.org/`
- Yearly training on the use of robots and software

Sample achievement: Robotpkg

robotpkg: compilation and packaging framework for robotics software

- packages LAAS developped software or 3rd party
- handles dependencies and updates
- continuous integration
- binary package build farm
- support for different Linux distributions
- 400+ existing packages



Sample achievement: Instrumenting Mana

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- Bare Segway RMP-400.
- Integration of equipments done by the robotics platform.
  - Power distribution,
  - Safety devices (bumpers, radio emergency stop,...),
  - *Velodyne* laser telemeter, Cameras, *Novatel* RTK GPS, *Xsens* IMU, *KVH* optical fiber gyroscope, PTUs. . .
  - Embedded PC *(Core I7)*, wifi adapter,,...
  - Software development for the control of the mobile base and sensor data acquisition (using GenoM)

Access to the platform

The Platform can be used by collaborative research projects involving LAAS

- formal projects (ANR, European projects like H2020,...)
- direct collaborations with other research institutions or industrial partners
- visiting PhD students or researchers

The steering committee can be asked to validate an access request.

Future projects

- Outdoor aerial drone arena
- Mobile manipulators
- ROS2 integration (software)
- More cooperation with similar platforms