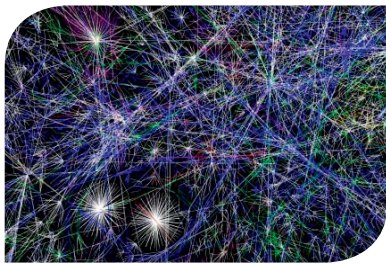
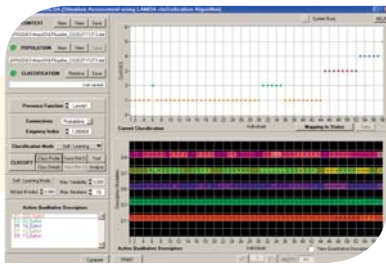


# LAAS-CNRS



Microsystems

Micro and Nano Technologies

Automatic control

Networks

Dependable computing

Robotics and AI

Interaction with life

Pervasive Intelligence



The MINAS Area research groups work on micro and nano systems design and fabrication for telecommunications, embedded systems, energy management, medical diagnosis and chemical analysis, using a 1500 m<sup>2</sup> clean room as well as CAD and characterization facilities.

**8 RESEARCH GROUPS**

**82 RESEARCHERS**

**133 PhD STUDENTS**

## The Research Groups

Integration of Energy Management Systems

Micro and Nanosystems for Wireless Communications

Microwave Integrated Devices and Systems for Telecommunications

Photonics

Nanobiosystems

Microdevices and Microsystems for Detection

Nano Engineering and System Integration

High Frequency Fluidic Micro and Nano Systems

## To study and develop multidisciplinary and multifunctional micro and nano systems

- Micro and nano technologies integrating new functional organic and inorganic materials, heterogeneous integration technologies
- Multi-physical and multi-scale modeling for micro and nano systems, bionanotechnologies and ultimate electronics
- Complex Microsystems design, virtual prototyping
- Microsystems reliability
- Micro and nano systems for detection and actuation
- Micro-nanofluidics, nanobiosystems
- Optical sources and functions for photonic integration, nanophotonics, MOEMS and micro-optics
- Power-electronics components, electrical and photovoltaic energy management integration systems
- RF-MEMS and integrated microwave circuits

## Highlights

- High-sensitivity, diffraction-based biochip fabricated by nanoimprint
- Silicon nanowires-based high resolution thermometry
- Microsupercapacitors (0.5 mF/cm<sup>2</sup>) fabricated by inkjet printing
- Realization of Deep Trench Termination (DT2) for high voltage power devices
- Modeling tools for the blind prediction of biomolecular flexibility: case of the HIV-1 protease
- Integration of energetic nanomaterials

## Application Fields

- Telecommunications, Mobile Phones
- Pharmacological Research and Bio-Medical Diagnosis
- Aeronautics and Space
- Domotics
- Adaptive and ophthalmic optics
- Metrology





**SINC**

# CRITICAL

CRITICAL INFORMATION SYSTEMS RESEARCH AREA

# INFORMATION SYSTEMS

The SINC Area research groups work on the definition, validation and exploitation of both formal and experimental methods and techniques for the design, verification, evaluation and development of software-intensive critical systems.

**4 RESEARCH  
GROUPS**

**54 RESEARCHERS**

**49 PhD STUDENTS**

## The Research Groups

**Dependable Computing  
and Fault Tolerance**

**Software and Tools for  
Communicating Systems**

**Systems Engineering  
and Integration**

**Distributed Computing  
and Asynchronism**

## To design and analyze information processing architectures within networks, embedded systems and critical infrastructures

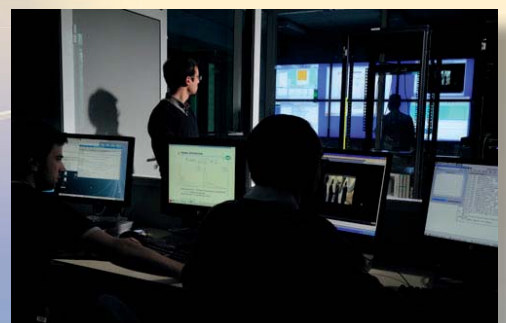
- Dynamic and complex systems: autonomy, evolvability, self-adaptivity
- Functional and non functional specifications: real-time, quality of service, safety, resilience, computer security and privacy
- Network topology, communication protocols and composition of properties
- Resilient architectures with respect to accidental faults and malicious faults
- Ubiquitous computing: strong interactions, mobility of users, devices and services
- Distributed computing, asynchronous algorithms and networks
- Modeling and evaluation using stochastic processes
- Real-time simulation and distributed co-simulation
- Methodologies for the design, simulation and prototyping of heterogeneous systems
- Analysis and experimental characterization in nominal or disturbed operation modes

## Highlights

- Coordination of the European Network of Excellence "Resilience for Survivability in IST"
- Characterization of Internet attacks using honeypots
- Design of a multi-domain and multi-technology architecture with guaranteed quality of service
- Development of the verification chain Fiacre/TINA in the open source software TOPCASED
- Realization of a demonstrator of mobile systems on a small scale for testing the resilience of wireless networks
- Techniques for protecting privacy within the IP PRIME project, Privacy Innovation Technology Award 2008 of IAPP
- Award of the French Academy of Science in Informatics

## Application Fields

- Aeronautics and Space
- Ground Transportation
- Telecommunications and Networking
- Production Systems
- Energy Distribution
- Services





# MODELING, OPTIMIZATION MODELING, OPTIMIZATION AND CONTROL OF SYSTEMS RESEARCH AREA AND CONTROL OF SYSTEMS

The MOCOSY area research groups work on uncertain dynamic continuous-time or discrete-event systems and production systems. Close links exist with the Applied Mathematics and the Artificial Intelligence Communities.

**4 RESEARCH  
GROUPS**

**50 RESEARCHERS**

**37 PhD STUDENTS**

## The Research groups

Diagnosis and Supervisory Control

Methods and Algorithms in Control

Modeling, Optimization and Integrated Management of Activity Systems

Modeling and Control of Networks and Signals

## To observe, control, optimize dynamic systems at different levels of abstraction and according to different architectures

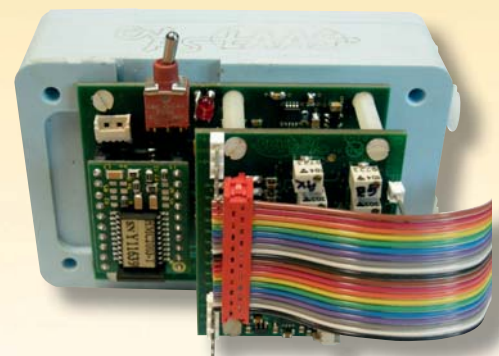
- Robust and structured control laws synthesis
- Stability analysis by parameterized Lyapunov functions
- Diffusive representations and non linear operators
- Advanced decision structures: multilevel and/or distributed, reactive and robust
- Optimal resource allocation and scheduling
- Combinatorial optimization and constraint programming
- Theory of moments, optimization and algebraic geometry
- Volterra filtering, particle filters
- Set-membership fault detection
- Hereditary algorithms for identification
- Model-based and logical diagnosis
- Surveillance and supervision using learning methods

## Highlights

- Software tools: Gloptipoly, RoMulOC, Ca~En, Koala, DIADES, SALSA, ...
- ORDO software used by 80 production units in France
- Geolocation system for the ill sighted
- Hybrid simulation in networks
- Deterministic version of particle filtering
- Participation to the launch of the Japanese French Laboratory for Informatics (LIA JFLI)
- Lagrange Prize in continuous optimization
- Amélia Earhart Prize of Zonta

## Application Fields

- Aeronautics and Space
- Transportation Systems
- Health
- Telecommunications
- Environment
- Production
- Defense



# ROBOTICS AND ROBOTICS AND ARTIFICIAL INTELLIGENCE RESEARCH AREA ARTIFICIAL INTELLIGENCE

The RIA area research groups work on robot operational and decisional autonomy and on the development of complete robot systems. Experimental facilities include several ground and aerial robots, mobile manipulators and a humanoid robot.

**3 RESEARCH  
GROUPS**

**22 RESEARCHERS**

**51 PhD STUDENTS**

## The Research groups

Robotics, Action and  
Perception

Robotics and  
Interactions

Humanoid Motion

## To take up the challenge of robot operational and decisional autonomy

- Environment stochastic modeling
- Algorithmic motion planning
- Non-holonomic systems control
- Autonomous navigation and localization
- Temporal planning and supervision
- Human-robot decisional interaction
- Perception and modeling of humans
- Design and validation of cognitive architectures
- Learning
- Multi-robot cooperation and coordination
- Integrated sensors

Such interdisciplinary research applied to areas ranging from embedded systems to biochemistry and neurosciences.

## Highlights

- Validation of robot control architectures
- Jido: an autonomous interactive robot
- Motion planning for humanoid robots
- Modeling and algorithms for molecular motion
- France-Japan JRL joint laboratory in humanoid robotics
- European (IST FP6/FP7) and national Collaborative projects on cognitive robotics
- Collaborative projects on cooperative aéroterrestrial robots
- Demonstration of integrated robots: Rackham, HRP2, Jido (London, Paris, Prague)
- Open source software for robotics

## Application Fields

- Environment exploration and surveillance
- Automotive and transportation systems
- Aeronautics and Space
- Embedded Systems
- Defense, Civil Security
- Biochemistry
- Health
- Neuroscience
- Services





LAAS is a research unit of the CNRS, the French National Centre for Scientific Research. LAAS is associated with the University of Toulouse. LAAS conducts pluridisciplinary research in the areas of Information and Systems Sciences and Technologies, within four domains:

- Micro and Nano Technologies,
- Automatic control, Optimization and Signal Processing
- Critical Information Systems,
- Robotics and Artificial Intelligence.

**656 persons**

- 202 researchers and faculty members
- 262 PhD students
- 68 post-docs and visiting researchers
- 122 engineers and technicians

**900 annual publications**

**19 research groups**

**16 M€ of annual operational budget**

Involvement in 3 competitiveness clusters. Member of the RTRA STAE (Sciences and Technologies for Aeronautics and Space Network).



**Two transdisciplinary axes**

- Interactions with life (biology, humans)
- ADREAM: program on networked and ubiquitous systems

**A continuing scientific challenge**

To understand, design and master complex, natural or artificial, integrated or divided systems.

**Experimental and development facilities serving research**

- Micro and Nano Technologies Platform with 1500 m<sup>2</sup> clean room
- Characterization Platform for micro and nanosystems
- Computer-Aided Design (CAD) facilities
- Experimental Networking Platform
- Embedded Systems Platform
- Robotics Platform

**Close Industrial Relationships**

**• Carnot Label**



**• Joint labs with industries**

- AIRSYS with Airbus
- LISPA with Freescale
- PEARL with Alstom
- PixCell with Essilor
- Autodiag with Actia

**• 5 startups**

- Kineo: motion planning
- Neosens: chemical sensors
- QoS design: simulation/optimization for networks
- Tag Technologies: microsystems for motion detection in Domotics
- Noomeo: 3D sensors for CAD

**• Industrial affiliates Club:**

- 64 companies



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