GIAA

APPLIED
ARTIFICIAL
INTELLIGENCE
GROUP

Image: UC3M photographic files

Universidad
Carlos III de Madrid
www.uc3m.es

Robot

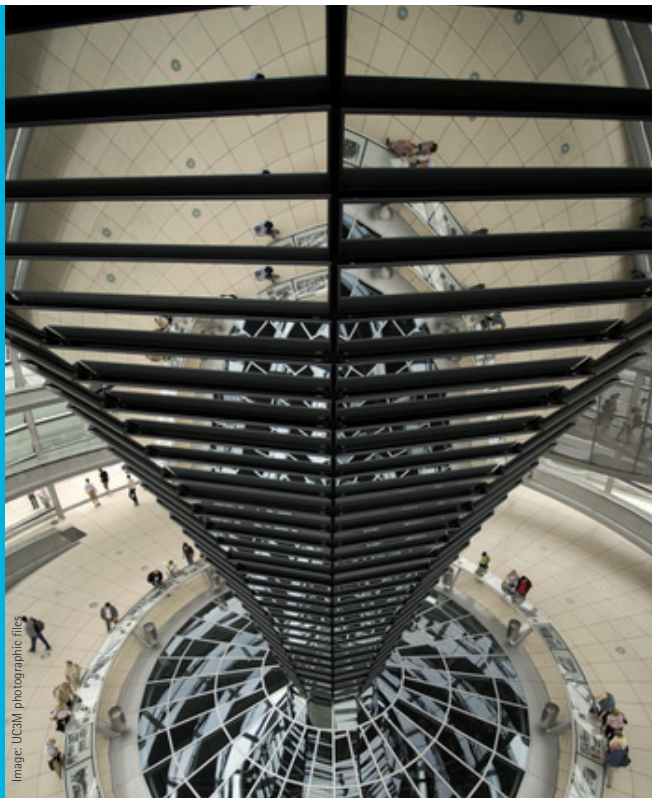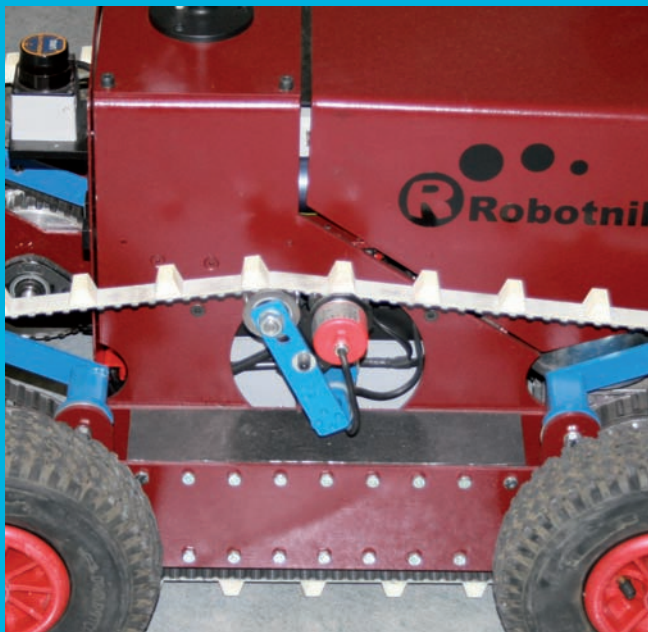The **Applied Artificial Intelligence Group (GIAA)**, led by Dr. José Manuel Molina López, is formed by a team of more than fifteen physicists, telecommunications and information engineers who are nationally renowned due to their ability to solve engineering problems by incorporating the most novel artificial intelligence techniques: **automatic learning, evolutionary computation, data analysis, multi-objective optimization, fuzzy systems and intelligent agents.**
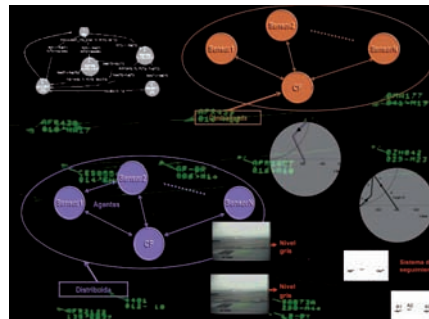
The group has a long work history providing consultancy to companies and developing customized solutions for prediction, optimization, data fusion and signal and image processing.

• RESEARCH ACTIVITIES •

· Automatic Learning and Data Mining Techniques

· Evolutionary Computation and Multi-Target Optimization

· Agents and Multi-agent Systems: web, information retrieval, electronic commerce, sensor management

· Computer Vision

· Contextual Information and Data Fusion Systems

· Surveillance systems

· Air Traffic Control (ATC)

· Coastal Surveillance and Maritime Traffic

· Indoor location systems

· Inference in adaptive, non-linear and dynamic systems

· Unmanned vehicles

• OUTSTANDING COLLABORATIONS AND R&D PROJECTS •

The GIAA collaborates with a number of companies, providing consultancy and advisory services, giving customized training courses and participating in national and international R&D projects. Some of these companies are: ENDESA, INDRA, AENA, ISDEFE, GENASYS II SPAIN, THOMSON AYRSYS, BAE SYSTEMS, PARK AYR SYSTEMS, AMPER Sistemas, PORTEL, TCP, ACCIONA, INSPIRALIA.
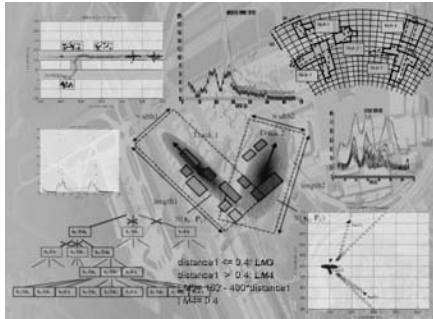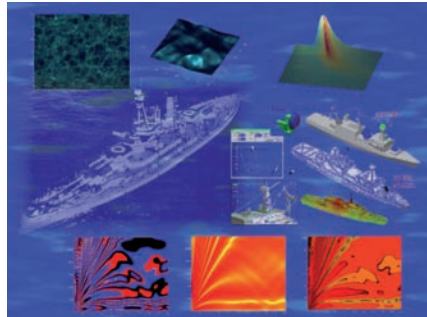

Agents' application to RADAR Systems

It also maintains a close relationship with the Data Processing and Simulation group of the Telecommunication faculty of the Universidad Politécnica de Madrid and with the Centro de Difusión de Tecnología (Technology Dissemination Center - CEDITEC).

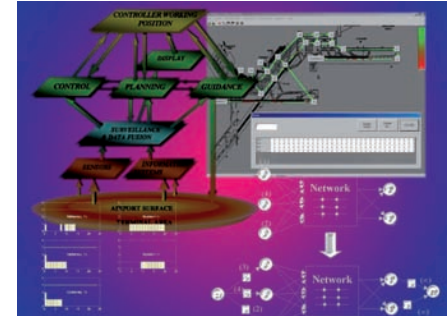Some of the most relevant recent R&D projects of the GIAA group are:

· CENIT program (Ingenio 2011) ENERGOS: Technologies for the automatic and intelligent management of the future energy distribution networks.
Funding Entity: Centre for the Development of Industrial Technology. Date: 2009-2012.

· CENIT program (Ingenio 2010) INTEGRA: Research in Technologies for Migration Management.
Funding Entity: Centre for the Development of Industrial Technology. Date: 2008-2011.
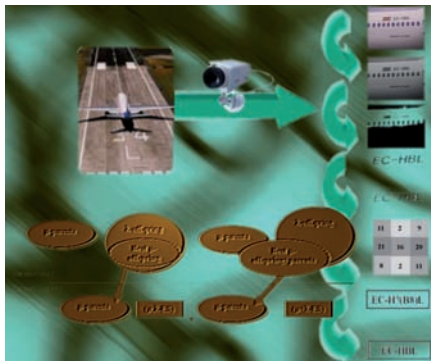
Radar Surface Model
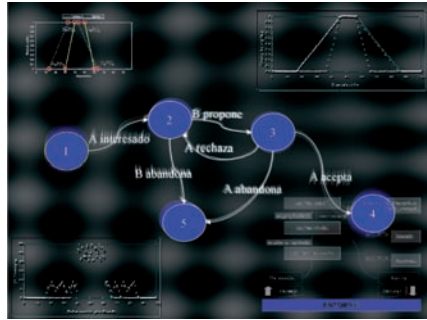

Radioelectric Model

Aeroport planning system

· CENIT Program (Ingenio 2010) SEDUCE: System for the Detection of Explosives in Public Infrastructures and Centers.
Funding Entity: Centre for the Development of Industrial Technology. Date: 2008-2011.

· CENIT program (Ingenio 2010) ATLAN-TIDA: Application of leader technologies to unmanned aerial vehicles for research and development in ATM.
Funding Entity: Centre for the Development of Industrial Technology. Date: 2007-2010.

· CENIT program (Ingenio 2010) TIMI: Intelligent transport of intermodal freight transportation
Funding Entity: Centre for the Development of Industrial Technology. Date: 2007-2010.

· CONTEXTS (Concepts and technologies for the development of contextualized services).
Funding Entity: Community of Madrid. Date: 2010-2014.

· MADRINET (Multidisciplinary ADvanced Research In user-centric wireless NETwork enabling technologies).
Funding Entity: Community of Madrid. Date: 2006-2010.

· LOCATIL: Sensor fusion techniques and rationale for services based on location and context: application to AAL.
Funding Entity: Ministry of Science and Innovation. Date: 2008-2011.

● INNOVATIVE TECHNOLOGICAL SOLUTIONS ●

· **Surveillance system based on cameras,** to monitor and identify surface traffic in airports (planes, trucks and buses) by means of cameras.

· **Airport data fusion simulation system,** for the processing of surface radar and integration with other sensors, following the A-SMGCS paradigm.
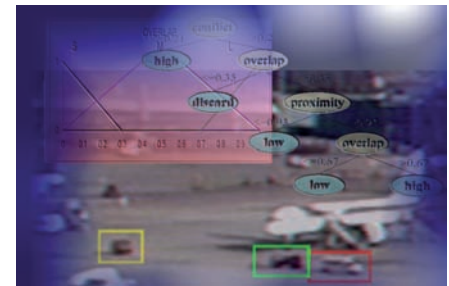

Reputation system

· **Optimization, Prediction and Data Analysis Software,** targeted at computer sector companies interested in integrating these techniques into the products and solutions that they offer.

· **System of software agents for surveillance.** The technology improves the surveillance process, reducing human attention and introducing automatic alarms.

· **Recommendation system based on the reputation of personal subjective opinions.** Automated reputation management process which customizes the recommendations in electronic commerce processes.

· **Multisensor Navigation System.** A software architecture and algorithmic solution for multisensory navigation in autonomous vehicles, tested in air traffic and robotic applications.

Airport tracking system

Number plate recognition system

•SCIENTIFIC-TECHNICAL SERVICES•

· Optimization of processes.

· Extraction of behaviors from the intelligent data analysis.

· Automation of dynamic planning and decision making processes by means of automatic learning techniques.

· Design of Data Mining tools using intelligent data retrieval techniques.

· Improvement of electronic commerce services by means of using intelligent agents in the Internet.

· Application of artificial intelligence and simulation techniques to the resolution of engineering problems.

•EQUIPMENT•

The investment in the provision of infrastructure for the research group amounts to about 750,000€. The research laboratory has been equipped with high-performance computational systems, cameras, location and communications network, etc.

The wireless location system is formed by an Aruba WiFi location system and by a Ubisense Ultra Wide Band location system, the two systems are portable and can be used in any testing environment of up to about 400 m^2.

Communication structure with a Hokuyo Laser Sensor with an engine and GPS receiver incorporated in a robot

In the sensor fusion area, the group has a highly sensorized unmanned ground vehicle (UGV). It is the Guardian robot, from Robotnik Corp., equipped with GPS position sensors, IMU Crossbow card with 3D positioning, encoders, Hokuyo laser, line tracking and obstacle proximity sensors. The suitable interfaces are used through the OpenGL Player platform to read the sensors and develop the data fusion and control algorithms.

GIAA

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IMAGE OF COVER: *Reichstag*

Iñaki do Campo