

Intelligent Systems Lab / Laboratório de Sistemas Inteligentes
<http://islab.isr.ist.utl.pt>





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Outline

SocRob – **S**occer **R**obots or **S**ociety of **R**obots

RESCUE – Cooperative Navigation for Rescue Robots

RAPOSA - **R**obot semi-**A**utónomo **P**ara **O**perações de **S**alvamento

FEMDS – Formation Estimation Methodologies for Distributed Spacecraft

Educational Robots

Other Projects:

- High Resolution Optical Satellite Sensors
- MultiBot - Modelos e Técnicas para Robots Móveis Inteligentes Aplicados a Tarefas Individuais e Cooperativas
- Robots to Compete in Portuguese Robotics Open UIP Class



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SocRob – Soccer Robots or Society of Robots

FUNDING: Currently FCT, also several sponsors in the past

OBJECTIVES:

S&T Promotion

Education

Research

Navigation
Sensor fusion
Logic-Based Planning
Task Modeling and Coordination
Learning



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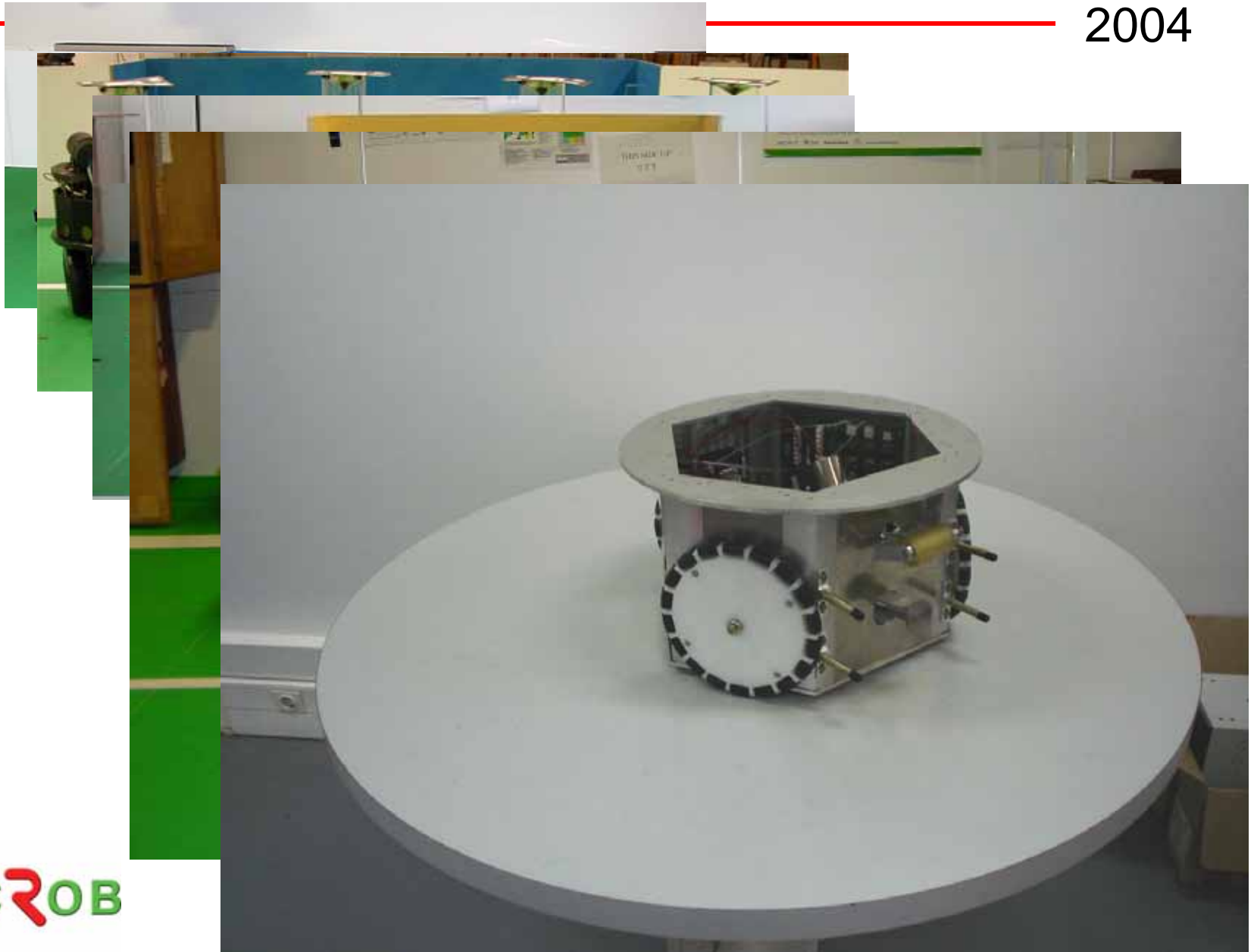


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HISTORY – *RoboCup Middle Size League*

2004



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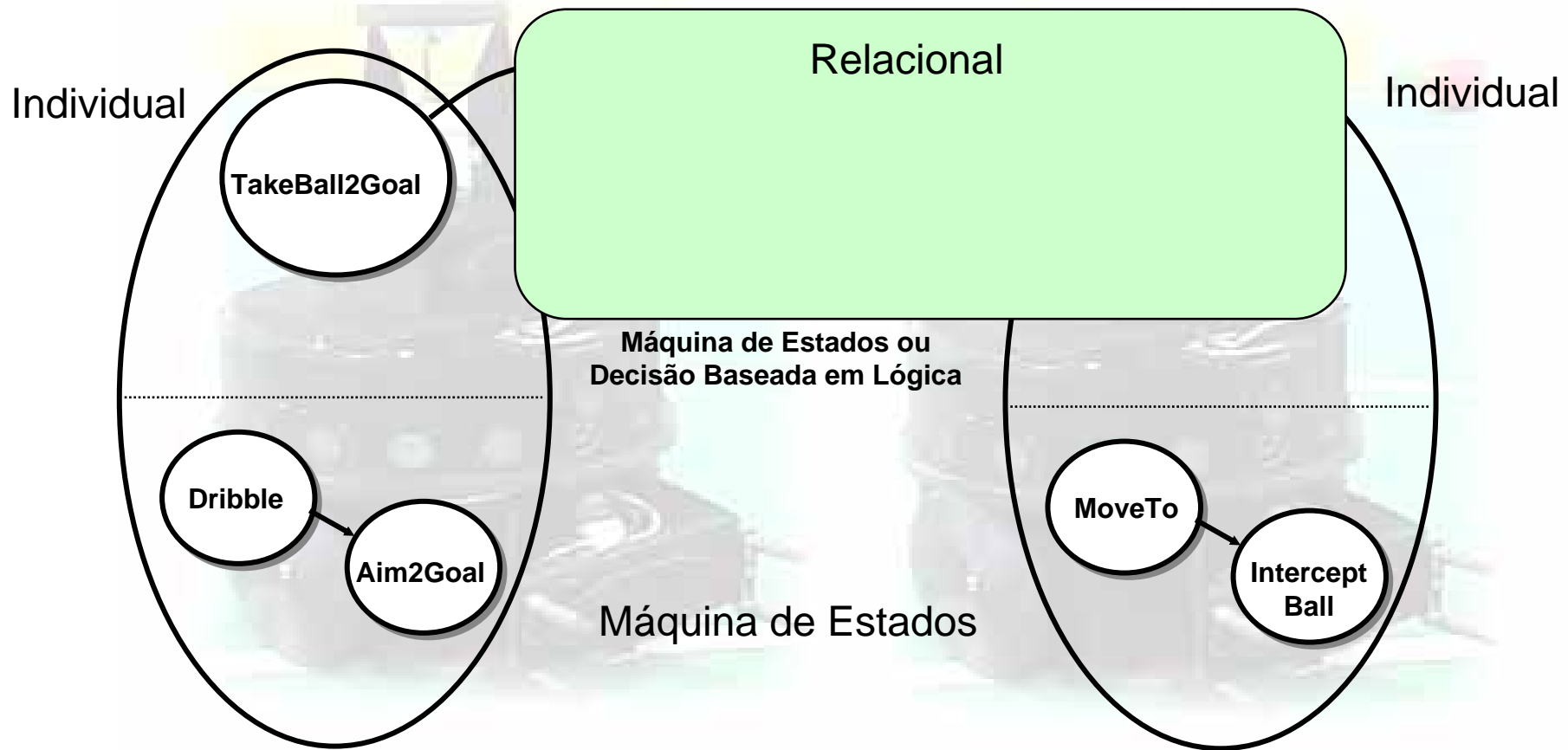


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Arquitetura Funcional

(Pedro Aparício, Rodrigo Ventura, Pedro Lima, Luis Custódio, 1998-1999
Miguel Arroz, Vasco Pires, Luis Custódio, 2002-2003)



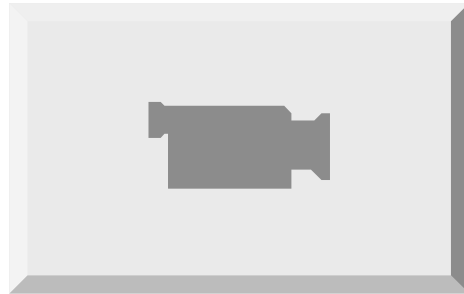
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Resultados Recientes



Pass between 2 robots using joint commitment theory



Formation control with 3 scouts, using separation-bearing for the first two, with separation 1 meter and bearing 90 deg, and separation-separation (1 meter) for the third one





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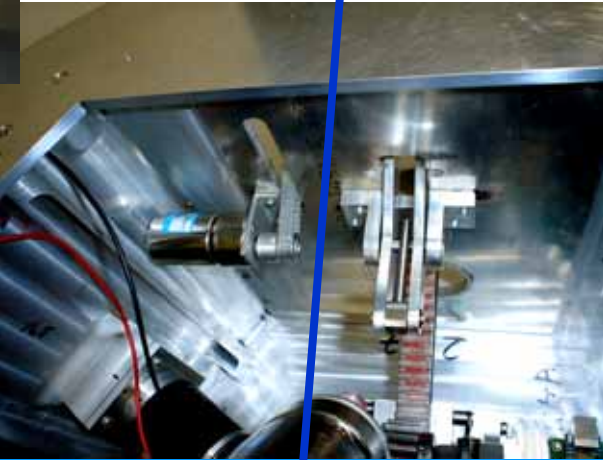
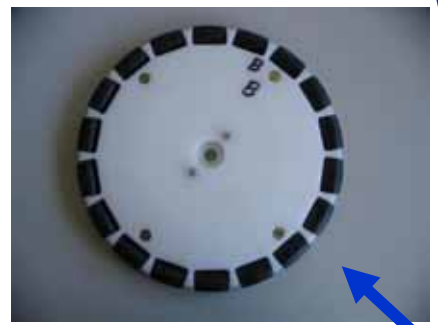
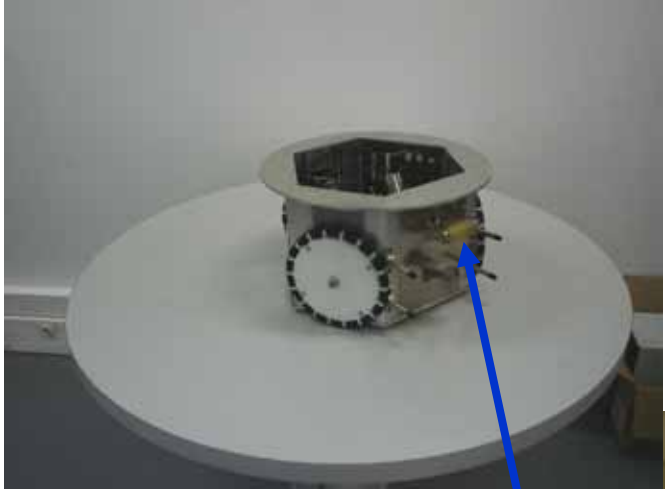


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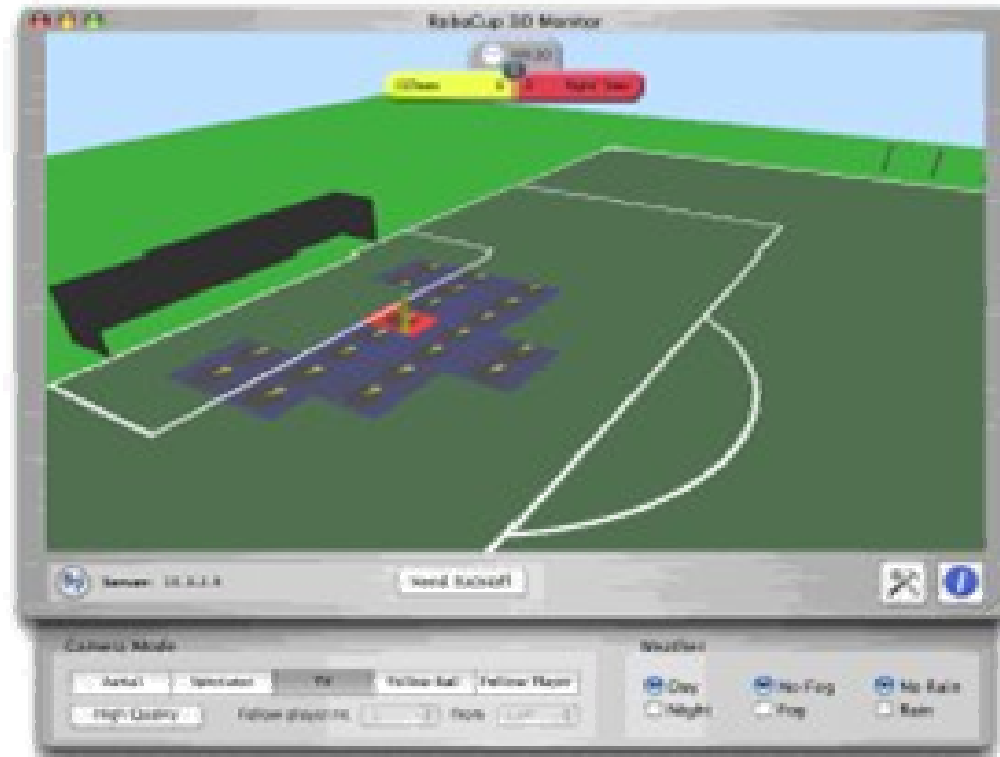
NEW ROBOTS

FCT Project, PARTNERS: IdMind, ServiLog



- Omnidirectional wheels
- On board laptop and plug&play principle
- Closed-loop control of kicker displacement (=> ball speed)
- Optical mouse and rate-gyro to improve odometry
- Ball control by a rolling drum

RoboCup SOCCER SIMULATION LEAGUE



- Regular participation in RoboCup since 2003, in the *coach*, *presentation* and *game* subleagues.
- Research on emotions and learning applied to MAS



RoboCup 4-LEGGED LEAGUE

- Goal is to push the SocRob project towards higher abstraction level issues, by using a standard platform and starting from code developed by other teams
- Code modularity should allow its exchange with the MSL team

- Currently run by volunteers only
- Still in the stage of understanding AIBO's code and hardware functionalities



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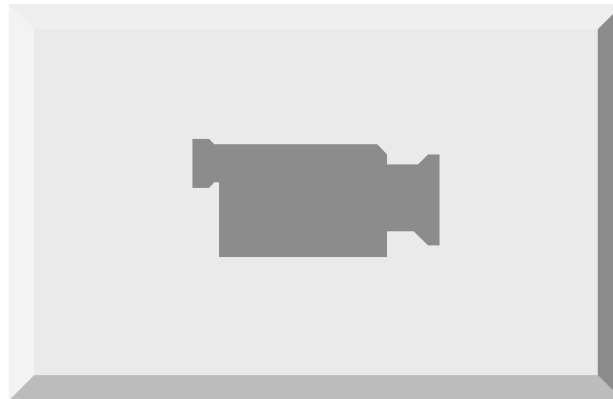
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RESCUE – Cooperative Navigation for Rescue Robots

FUNDING: FCT

OBJECTIVES:

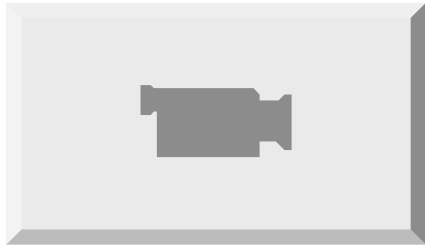


PARTNERS: Mobile Robotics Lab, Computer Vision Lab

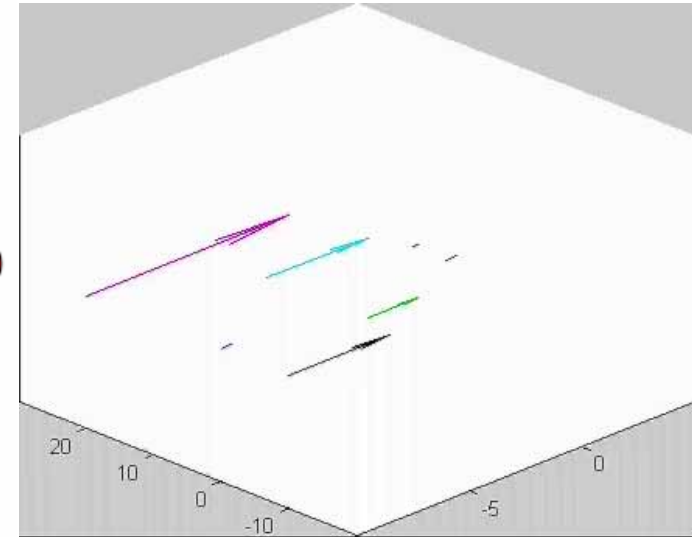
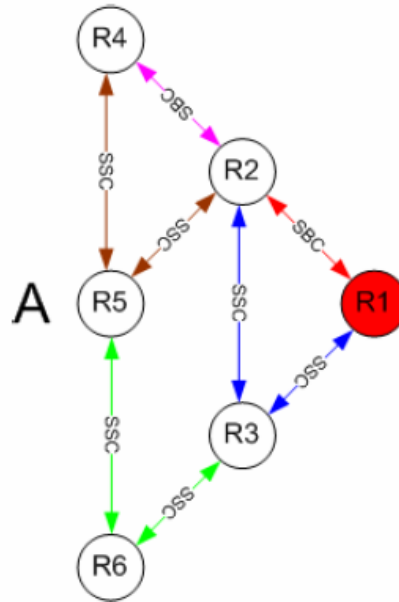


RESCUE – Cooperative Navigation for Rescue Robots

Vision-Based Aerial Robot Control



Formation Control



Other research in the project within our Lab:

- Distributed Planning for a Multi-Robot Team
- Agent-Based Software Architectures
- Navigation Controllability for Heterogeneous Robot Teams (co-supervision with MRL)



RAPOSA

Robot Semi-Autónomo para Operações de Salvamento

FUNDING: Agência de Inovação

OBJECTIVES: To build a semi-autonomous robot that can be used in the short-term by fire fighters in Search and Rescue operations, with technological innovation components. The robot includes several hazard detection sensors (gas, temperature, humidity, ...) and a thermal camera



PARTNERS:



IdMind, Engenharia de Sistemas, Lda - *LÍDER*



ISR – pólo do IST



Regimento de Sapadores Bombeiros de Lisboa



*Center for Robot Assisted Search and Rescue,
University of South Florida, USA*



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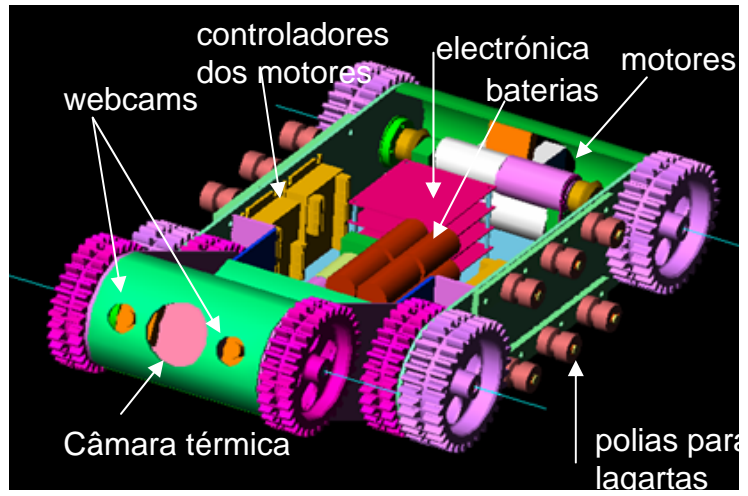


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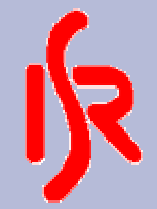
RAPOSA

Robot Semi-Autónomo para Operações de Salvamento





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FEMDS

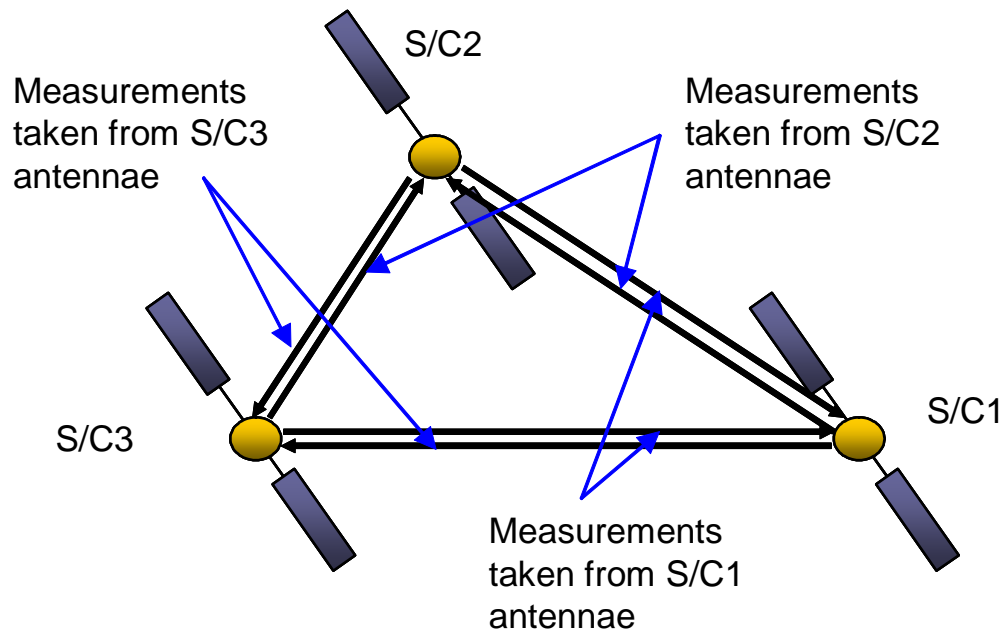
Formation Estimation Methodologies for Distributed Spacecraft

FUNDING: ESA, European Space Agency

OBJECTIVES: Study of methodologies for formation Flying Spacecraft **GNC:**

- Distributed formation state estimation (**Navigation**)
- Trajectory planning with optimal fuel spenditure and collision avoidance (**Guidance**)
- Estimator in the loop + unmodeled dynamics + perturbations closed loop **Control**
- Mission Analysis (includes orbit dynamics, modes definition and mode switching conditions)
- Mission Coordination (includes detecting switching conditions and meeting mode specifications)

PARTNERS: DEIMOS Engenharia





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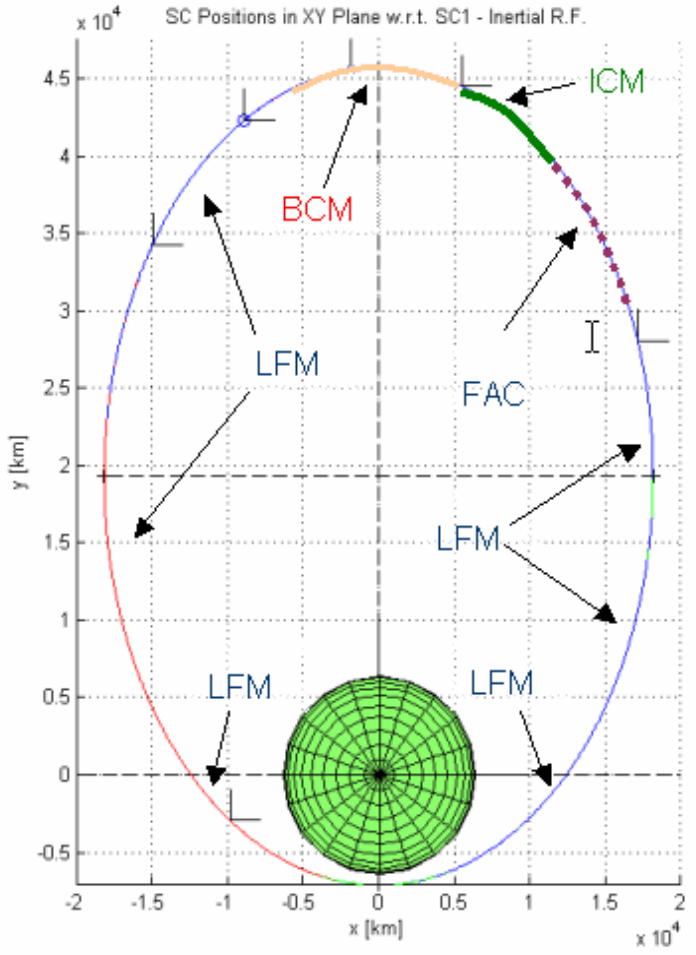
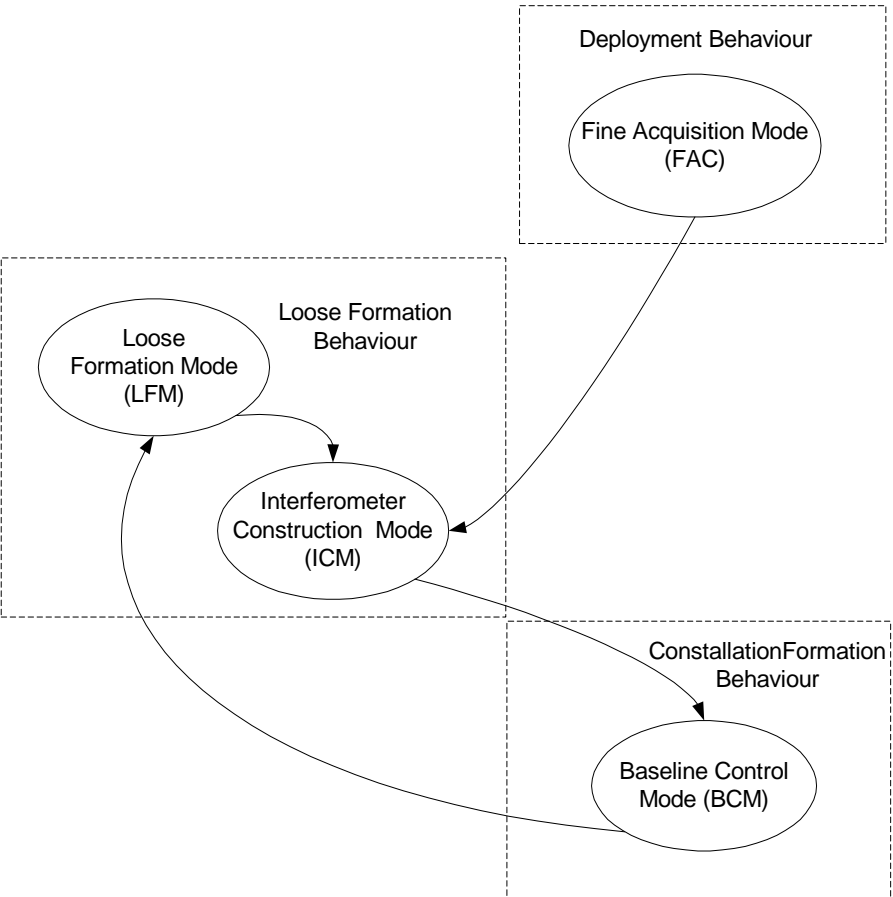
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FEMDS

Formation Estimation Methodologies for Distributed Spacecraft

Modes





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Educational Robots

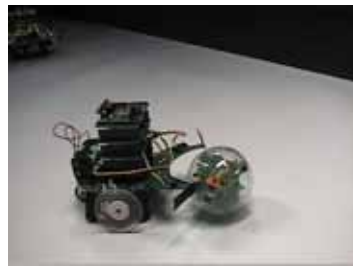
FUNDING: Agência Nacional para a Cultura Científica e Tecnológica – CIÊNCIA VIVA

OBJECTIVES: To promote S&T interest and education among young people, through Robotics

PARTNERS: INETE – Instituto de Educação Técnica

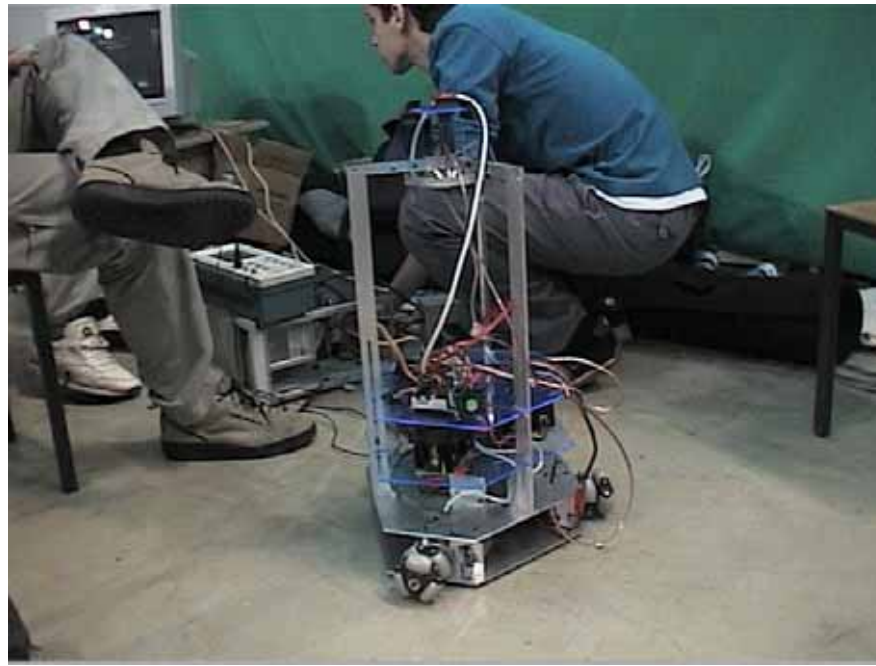


- Robotics multi-disciplinarity makes it an ideal vehicle for S&T education
- At INETE, after 5 years of the RODITAS project, building the robot became part of the curriculum of several courses (e.g., Physics, Electronics, Programming)
- 1-2 weeks Summer Schools at IST for several students from High-School – BIG SUCCESS!



Other Projects

- High Resolution Optical Satellite Sensors
- MultiBot - Modelos e Tecnicas para Robots Móveis Inteligentes Aplicados a Tarefas Individuais e Cooperativas
(*Cooperation with Universidade Politécnica de S. Paulo and ITA, Brasil*)
- Robots to Compete in Portuguese Robotics Open UIP Class



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Brief Presentation of Some ISLab Projects



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Institute for Systems and Robotics
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