Riccardo Caccavale

Tutor: Alberto Finzi

XXIX Cycle - I year presentation

An Architecture for Attentional Regulation in Robotic Cognitive Control

UNIVERSITÀ DEGLI STUDI DI NAPOLI
FEDERICO II

Background

Graduation MS: Computer Science (Computational Models) Federico II.

DIETI groups: PRISCA laboratory of advanced cognitive science, PRISMA laboratory of industrial robotics.

**Collaborations:** LAAS-CNRS (Toulouse), TUM (Munich)

The Problem

Long Term: Autonomous robotic system endowed with executive functions supporting decision-making, perceptual processing, and behavior orchestration.

Short Term: Cognitive control methods suitable for the integration of high level cognitive processes and lower level task execution in Human-Robot Interaction.

Resarch Activity: Starting Point

Exploiting ***Attentional Regulation*** as a key mechanism for the orchestration of robotic behaviors.
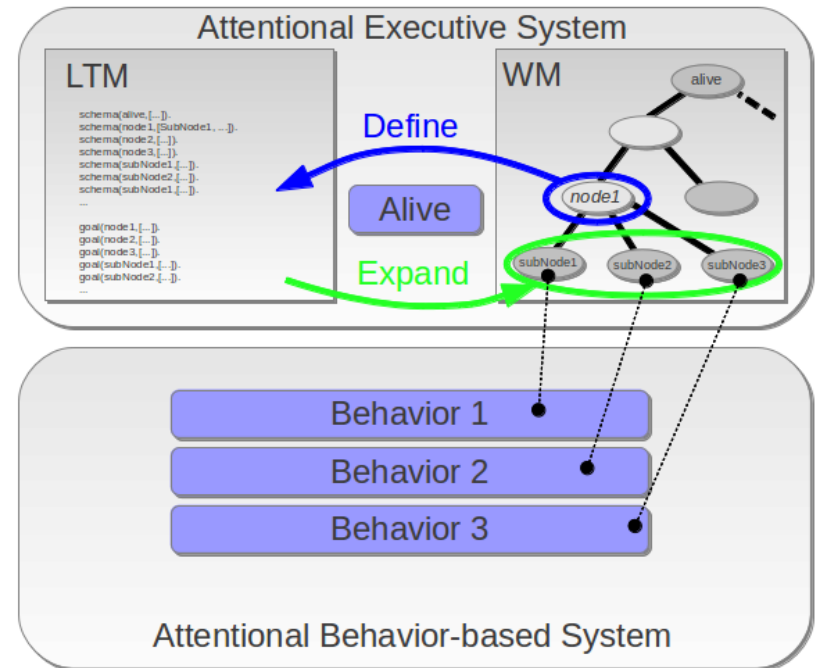
Design of an architecture where proactive and reactive processes and their competition for the shared resources are managed by ***top-down*** and ***bottom-up*** stimulations (*contention scheduling*).

Research Activity: Summary

- Further investigations of the ***contention scheduling*** as a mechanism for the behavior management:
  - Execution of multiple structured tasks.
  - Attentional amplification for goal orientation.

- Study of the attentional system in ***Human-Robot Interaction***:
  - Using multimodal interaction (speech, gestures, etc.) and dialogue to drive attention.
  - Continuous multimodal fusion for human intention recognition.
  - Interpretation of the human intentions driven by the task structure.

- Investigation of the attentional regulation for the flexible execution of ***multiple plans***:
  - Plan execution trough attentional regulation in dynamic environments.
  - Attentional regulation and plan-switching during multiple plans execution.

Research Activity: Testing

Simulated
Scenario

Research Activity: Testing
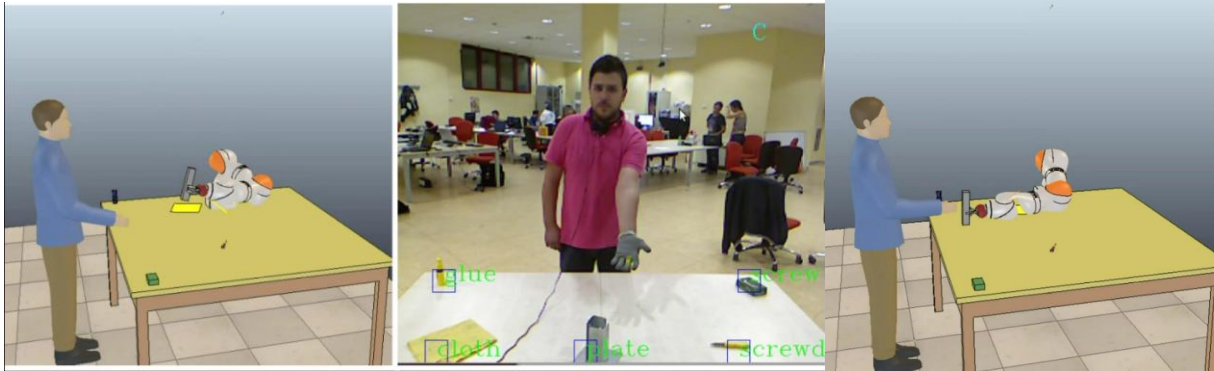
Simulated Scenario

SAPHARI Scenario (FP7 EU project)

Real-World Scenario

Productions

- Attentional Regulations in a Situated Human-Robot Dialogue, in proceedings of ROMAN-2014 (***International*** *conference paper*).

- Attentional top-down regulation and dialogue management in human-robot interaction, Proceedings of the 2014 ACM/IEEE international conference on Human-robot interaction (***International*** *conference paper*).

- Attentional Top-down Regulations in a Situated Human-Robot Dialogue. HRI-2014 workshop on Attention Models in Robotics: Visual Systems for Better HRI (*reviewed workshop paper at the conference HRI-2014*).

- Attentional Top-Down Regulations in a Situated Human-Robot Dialogue. ICRA workshop Robots in Homes and Industries: where to look first? (*reviewed workshop paper at the conference ICRA-2014*).

- Deliverable 7.5.1 for SAPHARI project (WP7).

Next Years

Year	Modules	Seminars	Research
I	15	5	50
II	(15)	(4)	(45)
III	(0)	(1)	(60)

Research:
- Further studies on attentional mechanisms.
- Planning and problem solving.
- Learning.

Seminars and Coruses:
- Robotic automation and control.
- Cognitive Science.

Riccardo Caccavale

Thanks for Your Attention
...Literally