

Post-doctoral position at IRIT/LAAS-CNRS, Toulouse, France

Title:

Model-based provisioning and management of adaptive distributed communicating and mobile cooperative systems.

Context:

This study is conducted in the framework of the ROSACE project (“RObots et Systèmes Auto-adaptatifs Communicants Embarqués” / “Robots and Embedded Self-adaptive Communicating Systems”) funded by the French Network for Advanced Research dedicated to Science and Technology for Aerospace Systems. The project is jointly conducted by IRIT, LAAS and ONERA. The project focuses on a multi-robots platform composed of uninhabited aerial/ground vehicles. This platform will be provided and maintained by LAAS-CNRS and ONERA as an experimental system that will be used to implement, illustrate and validate the outputs of the project.

Subject:

We consider the context of mobile entities cooperating in the context of a critical operation for crisis management. In such a context, we have to deal with heterogeneous and varying communications resources.

The targeted QoS properties to be guaranteed or preserved include:

- The availability of communication resources for a permanent connectivity.
- Preserving the quality of communications (performance and consistency with activity requirements).

Adapting the communication acts on the different communication layers (transport and middleware). It deals with the priorities of actors (possibly identified by their roles) and the priorities of the exchanged data. Adaptation aims to handle changes in constraints at the level of communication and processing resources.

Adaptation may act on the deployment configurations using dynamically reconfigurable protocols and software architectures. Adaptation may also act by modifying the behaviour of the involved communicating entities, for example for serving as a communication relay, or more generally for serving to maintain OoS. This can be achieved by activating predefined functions or by acquiring new functions or by delegation to external dynamically discovered services.

Adaptation Management requires monitoring the ROSACE communication system in order to satisfy current requirements, and monitoring the supported activity in order to handle the evolution of these requirements. Adaptation Management also requires the capability to cooperate with the monitoring layers by receiving change notifications and by sending alarms when adaptation is not possible.

The planned models for managing the different aspects of adaptability (architecture, decision, context description) include namely (but are not limited to):

- Agents and multi-agents Systems
- Ontology and Semantics, Analytical models
- Graph transformation systems

Different levels of communication are covered (transport and middleware namely). This allows to guarantee the continuity of the service from the qualitative point of view (QoS and security) as well as functional (distributed objects, web services and agents). Different compositional design paradigms (agent-based, and service-oriented: MAS, SOA, SCA) and different cooperation modes are planned (publish/subscribe for example).

The contributions of the “adaptive communication” working group will include the followings classified wrt to their priorities:

1. Models Specialization/integration following a model-driven approach.
2. extension/implementation of support tools
3. application to crisis management scenario
4. Implementation /experimentation for communicating robots (LAAS and ONERA), communicating devices (sensors, or embedded and mobile devices like PDA or « smart phone ») in a wireless ad-hoc communication context.

Possible tasks for the post-doc candidate:

- Study and possibly participate to the definition of the architecture of the multi-level adaptability management system: namely distribution of adaptation on the different levels.
- Assess technologies and communication tools (available or to be acquired) in terms of:
 - o integration possibilities
 - o capabilities of supporting QoS properties
 - o usability for the system architecture
- Evaluation of the complementarities of the models and the techniques to cover the whole set of adaptability needs. Identify the necessary actions for its achievement.

Requirements: PhD in a related field among the following:

- Communicating system architecture (middleware and network)
- Adaptability models and techniques
- Model-driven design approaches
- Wireless and ad-hoc communication networks

Starting date: January 2009

Duration: 1 to 2 years

Applicants should send:

- a resume/bio
- pointers to their most important publications and/or their PhD (only French or English documents)
- recommendation letter(s)

Contact people:

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