

Sistemas multi-robot en aplicaciones de servicio y seguridad.
TEams of robots for Service and SEcurity missiOns

TESSEO

Investigador Principal - Main Researcher
Carlos Sagüés Blazquiz (16 participants)
csagues@unizar.es

Summary

The project proposes to investigate techniques for a multi-robot team to act in coordination in realistic scenarios. For the deployment, it is necessary to deal with algorithms and methods related to task planning and allocation, coordinated navigation planning, environment perception from multiple views provided by every member of the team, while the communication connectivity among all the elements of the system is maintained – robots, infrastructure, supervisor team, etc. Although some of the techniques involved are usually proposed in the literature and in many projects somehow independently, the research in this project will also be oriented to develop techniques integrating the different subjects involved. Only in this way it will be possible to develop realistic applications using systems with autonomous and supervised behaviours. Within the wide spectrum of scientific and technological challenges that appears in this kind of systems, several research objectives, grouped in three interdependent blocks, are going to be tackled in this project.

- **Multi robot navigation and planning**, with task allocation and motion planning for missions in complex environments with communication connectivity restrictions. We want to introduce the network communication restrictions into the motion planning. In motion and navigation we will incorporate the ideas of visual control to accurately get the target positions which may be defined through topological and metric maps. Additionally, coordinated motion strategies will be investigated to optimize the perception of the environment.

- **Perception and learning**. We will go deep into hierarchical methods for localization based on robust features for visual matching. We have special the interest in perception learning mixing laser and range sensing, to introduce in the system higher levels of abstraction. We want to allow the team of robots to act or take decisions based on semantic concepts, making reasoning in a way closer to human behaviours. As each robot perceives partial and incomplete information from the environment, we will work on static and dynamic consensus algorithms and we will introduce the

topological map building and maintaining using range and vision sensors. Additionally, communications maps will be investigated to take into account the quality of the communications while the multi-robot team is carrying out the task.

- **Communications.** We will take into account the real time and quality of service restrictions in MANET, Mobile Ad-hoc NETWORKS, which are required in multi-robot systems acting in coordination with humans. Special communication links are also to be investigated to allow the team to communicate when working in confined places and their integration into the MANET.

All these research topics will be evaluated in realistic scenarios oriented to surveillance, security and rescue applications.