

PhD Proposal MAP-I

Information fusion and low-level behaviours for multi-robot systems

Supervisors: Nuno Lau (nunolau@ua.pt) and António J. R. Neves (an@ua.pt)

Research Unit: Instituto de Engenharia Electrónica e Telemática de Aveiro (IEETA)

1 Motivation

Self-localization and mapping are classic problems of intelligent robotics, over which research is still extremely active. These are part of the more general challenge of defining, managing and updating the robot internal world model. The use of robot teams for the execution of complex tasks under dynamic environments is becoming common. Generally robots have access to partial and uncertain information, through a set of multi-modal sensors. In these environments, information fusion (of historical information and information coming from different sensors) is essential for the world model to be as precise as possible. Information fusion is usually addressed through the use of probabilistic techniques such as Kalman or particle filters, sometimes conjugated with maximum likelihood techniques.

The proposed research work is in the area of robotics and artificial intelligence and focuses in the construction/definition of the representation of the world model, information fusion and low-level behaviours for multirobot platforms.

2 Objectives

The main objective of this project is to develop fast and effective methodologies for building representations of the environment of multi-robots teams and make use of the representation of the model of the world in the creation of lowlevel behaviours. This includes:

- Study and testing of existing information fusion methodologies, both for single robot fusion or multi-robot team information fusion.
- Development of extensions for existing methodologies or creation of new ones, to improve the performance of the integration. Most of this task efforts will be applied in the development of multi-robot sensor and information fusion for cooperative world model building.
- Development of tools for validation of the representation of the world model, namely an external system with global static vision of the field of play.
- Study of low-level control methodologies for the creation of effective low-level behaviours.
- Development of algorithms with reduced human intervention for semi-automated and adaptable behaviour development.
- The developed methodologies will be integrated and tested in the context of RoboCup, mainly in the CAMBADA MSL soccer team.