

Thesis Proposal

January 2013

HIGH LEVEL NAVIGATION IN INDOOR ENVIRONMENTS

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Keywords: Robotics, Navigation, Human-Computer Interaction

Description

A domestic service robot requires a high level of reasoning about the environment and must be able to communicate with Humans using high level concepts. The robot should be able to autonomously learn and reason about locations and objects, i.e., it should be able to autonomously build a semantic view of its environment. Using this semantic viewpoint of the environment, the robot will efficiently navigate when asked to perform a certain task that requires more than just a motion to a location point. This proposal intends to research and develop high level navigation techniques for a mobile robot in an indoor environment with focus on using a semantic view to accomplish high level navigation tasks. The developed work will be tested and evaluated with the CAMBADA@Home platform, an indoor service robot developed in the University of Aveiro (IEETA).

Objectives

The aim of this proposal is to empower a service robot with reasoning capabilities for goal-directed navigation and introduce abstract concepts that can be used in the communication between the robot and Humans. The objectives are:

- adapt a fast and accurate localization algorithm, based on scan matching, to an indoor environment;
- build a knowledge database of models that may appear in the selected environments;
- construct a semantic map using the knowledge database, during autonomous or guided inspection;
- create a mechanism for human-robot interaction that will feed the robot with symbolic instructions that will result in the navigation plan using the semantic information of the environment.

The research will be tested and evaluated in the CAMBADA@Home platform, an indoor robot service of the CAMBADA team from the University of Aveiro. ROS (Robot Operating System) will be used as middleware software. The software developed during this PhD will contribute to the ROS community, by releasing the developed solutions as they mature and meet high quality standards.