

Hector Open Source Modules for Autonomous Mapping and Navigation with Rescue Robots

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Abstract. Key abilities for robots deployed in urban search and rescue tasks include autonomous exploration of disaster sites and recognition of victims and other objects of interest. In this paper, we present related open source software modules for the development of such complex capabilities which include *hector_slam* for self-localization and mapping in a degraded urban environment. All modules have been successfully applied and tested originally in the RoboCup Rescue competition. Up to now they have already been re-used and adopted by numerous international research groups for a wide variety of tasks. Recently, they have also become part of the basis of a broader initiative for key open source software modules for urban search and rescue robots.

1 Introduction

While robots used for Urban Search and Rescue (USAR) tasks will remain mainly tele-operated for the immediate future when used in real disaster sites, increasing the autonomy level is an important area of research that has the potential to vastly improve the capabilities of robots used for disaster response in the future.

The RoboCup Rescue project aims at advancing research towards more capable rescue robots [1]. Rescue robotics incorporates a vast range of capabilities needed to address the challenges involved, e.g. resulting from a degraded environment. The availability of re-useable and adaptable open source software can significantly reduce development time and increase robot capabilities while simultaneously freeing resources and, thus, accelerating progress in the field.

In this paper, we present open source modules that provide the building blocks for a system capable of autonomous exploration in USAR environments. Different modules have been applied with great success in RoboCup Rescue and other applications, both by Team Hector (Heterogeneous Cooperating Team of Robots) of TU Darmstadt and numerous other international research groups.

Robot Operating System (ROS) [2] is used as the robot middleware for the software modules. It has been widely adopted in robotics research and can be considered a de-facto standard. The provided modules have also become part of a recently established, broader initiative of the RoboCup Rescue community for providing standard software modules useful for USAR tasks [3].