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.

摘要。部署在城市里用于搜救任务的机器人的关键能力包括灾害地点的自动探索、受害者的急救　或者完成其他相关的目标。本文提出相关的开源软件模块 用于上述机器人的复杂能力的开发，这些软件模块包括：用于被破坏了的城市环境能够自定位和建图的hector slam。所有最初用于RoboCup营救竞赛的模块已经被的成功应用并测试。到目前为止，这些模块已经被为数众多的国际搜索团队重新使用和应用于广泛的各式的任务中去。 现如今，这些软件模块已经变成一个更广泛的用于城市搜救机器人的主要的开源软件模块项目的基础部分。

1. Introduction

1.引言

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 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].

虽然在未来的一段时间里，当机器人用于实际灾难地点的USAR任务的时候，依然主要是远距离遥控的，但是在未来，增加（机器人的）自动化水平是一个重要的研究领域，并具有潜力极大地促进灾难响应机器人的能力。

RoboCup援救项目旨在推动研究朝着（研究出）更多有能力的搜救机器人（的方向发展）。