Development of an Experimental Multi-robot CBRNE Reconnaissance Demonstrator
System Description and Technical Validation

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Abstract. This paper presents a prototype of a multi-robot reconnaissance system for detection of chemical, biological, radiological, nuclear and explosive (CBRNE) threats. Our system consists of different robot platforms which are able to carry highly modularized payload platforms: either a multi-purpose CBRNE sensor suite or a mobile manipulator for semi-autonomous sample collection. A variety of sensors is available for detection and identification of chemical and radiological hazards as well as for collecting potentially dangerous airborne biological particles. A manipulator can be used to gather chemical and biological samples directly from surfaces in the environment. A detailed description illustrates the robot platforms, the CBRNE sensor suite and relevant parts of the user interface. For a technical validation preliminary real world experiments are presented.

Keywords: multi-robot, CBRNE, hazard detection, emergency response.

1 Introduction

Chemical, biological, radiological, nuclear and explosive (CBRNE) incident response becomes increasingly important in our days. On one hand, threats by terrorist groups can cause great damage with relatively small effort. On the other hand, disasters in industrial areas may release dangerous and not easily detectable chemicals. If such an emergency occurs, information about what has happened and how the situation develops is crucial for an effective response. However, it is difficult to explore these scenarios without mortal danger for the involved action force, be it fire fighters, army or police. Unmanned systems help reducing the number of human beings which are required within the danger zone. Robots can support response planning and situational awareness. They can help removing responders from dangerous situations or even allow for immediate site feedback prior to human entry. A robot can be sent ahead, assess the situation at hand and return information and sensor data back to the controller. In [1] Humphrey and Adams classified eight fields of robotic applications in the domain of CBRNE emergency response. Using Cognitive Task Analysis (CTA) and

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