The Development of a Robotic Urban Search and Rescue System

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Abstract

This thesis presents the research, mechanical, electronic, and software design and development of an urban search and rescue system. In the long term this research will help provide the communications infrastructure to allow a team of robots to perform a wide range of tasks in an urban search and rescue operation. These tasks will include search for survivors using small form factors and varied sensors to rapidly and reliably detect people. The tasks are not limited to searching for survivors, as with different sensors the robots will be able to detect unseen hazards, such as gas leaks, and inform rescuers of potential dangers as they occur. These tasks are very dangerous and shifting the work to robots will help minimize the risks to human rescuers and minimise further casualties.

The aim of this research is to develop the communication network by which the robot system will communicate. This network will be an ad hoc network capable of changing in both structure and number of nodes at any point in time. The network relies on the ZigBee protocol and utilises the flexibility and strength inherent in the protocol. The system has been built and tests undertaken to test the range and reliability of the network when acting in this ad hoc manner. The research has also lead to the development of prototypes for two of the robots outlined in the proposed system. These robots have demonstrated the basic functions of the robots and allowed testing to be simpler and easier.

The system has been developed to mirror the proposed urban search and rescue system as much as possible. However, the research lends itself to a huge variety of applications. The overall system is essentially a wireless sensor network and the current work has shown the potential for using a mobile robot to deploy these sensors. This can be leveraged to work in any industry that requires sensor based monitoring to be distributed over large areas.

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“You miss 100% of the shots you don’t take”

- Wayne Gretzky

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