Intelligent Collaboration among Robotic Agents for Landmine Detection

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Declaration

The work submitted in this thesis is the result of my own investigations, except where stated.

It has not already been accepted in substance for any degree, and also not being concurrently submitted for any other degrees.

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Dedication

To my beloved parents
Ramanathar Vaithilingam and Pakkiyaledsumi Vaithilingam

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Abstract

Landmines remain as a significant barrier to economic and social development for more than sixty countries including Sri Lanka. Once a conflict comes to an end, the areas where landmines have been laid have to be cleared for human re-settlement. Demining is an operation accompanied with a lot of risk to human deminers. Analysis of the actions of the human deminers shows that some of them could be more easily and safely performed by robotic systems. From this perspective these robotic systems appear to have an important role to play in finding and removing millions of landmines from around the world.

This thesis proposes a novel algorithm for multi-robot collaboration for landmine search operations. The challenge is to enable robots to work together in an intelligent manner to detect landmines as fast as possible. Collaboration among robots is based on a decentralized approach in which robots are based on a set of behaviors; such behaviors are designed to increase global performance and are based in local information and shared information from other team members whenever they are within the range of communication. Landmine search method is improved using the prior knowledge about landmine field.

The effectiveness of the algorithm is demonstrated using extensive simulation studies. Result shows that collaboration of robotic agents and use of information about mine fields reduces the landmines search time dramatically.

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