University of Victoria | Graduate Studies

Notice of the Final Oral Examination
for the Degree of Master of Applied Science

of

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"Dynamic Sensor Deployment in Mobile Wireless Sensor Networks Using Multi-Agent Krill Herd Algorithm"

Department of Electrical and Computer Engineering

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Room 230

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Abstract

A Wireless Sensor Network (WSN) is a group of spatially dispersed sensors that monitor the physical conditions of the environment and collect data at a central location. Sensor deployment is one of the main design aspects of WSNs as this affects network coverage. In general, WSN deployment methods fall into two categories: planned deployment and random deployment. In this thesis, the focus is on planned sensor deployment of a Mobile Wireless Sensor Network (MWSN), which is defined as selectively deciding the locations of the mobile sensors under the given constraints to optimize the coverage of the network.

Metaheuristic algorithms are powerful tools for the modeling and optimization of problems. The Krill Herd Algorithm (KHA) is a new nature-inspired metaheuristic algorithm which can be used to solve the sensor deployment problem. A Multi-Agent System (MAS) is a system that contains multiple interacting agents. These agents are autonomous entities that interact with their environment and direct their activity towards achieving specific goals. Agents can also learn or use their knowledge to accomplish a mission. Multi-agent systems can solve problems that are very difficult or even impossible for monolithic systems to solve. In this work, a modification of KHA is proposed which incorporates MAS to obtain a Multi-Agent Krill Herd Algorithm (MA-KHA).

In order to test the performance of the proposed method, five benchmark global optimization problems are used. Numerical results are presented which show that MA-KHA performs better than the KHA by finding better solutions. The proposed MA-KHA is also employed to solve the sensor deployment problem. Simulation results are presented which indicate that the agent-agent interactions in MA-KHA improves the WSN coverage in comparison with Particle Swarm Optimization (PSO), Firefly Algorithm (FA), and the KHA.