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Intelligent Control of Distributed Decision Agents

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University of Moratuwa, Sri Lanka.

This thesis was submitted to the Department of Electronic and
Telecommunication Engineering of the University of Moratuwa in partial
fulfillment of the requirements for the degree of Master of Science

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Declaration

The work included in this thesis in part or whole has not been submitted for any other academic qualification at any institution.

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ABSTRACT

Advances in technology have enabled the manufacturing of massive numbers of deployable computing agents with integrated sensors and actuators. Networked multiple distributed agents in a remote environment will enable distinct event sensing, and information dissemination. Such a collection of deployed agents can perform as a distributed micro sensor network, which cooperates to solve at least one common application. The basic building block of such a network is its deployable agents, and those are considered to be autonomous, unreliable, and irregular in orientation. The interconnections are unknown and assembled in an ad hoc manner. Hence, intelligent control and expected dynamics in the system present unique challengers in the system design.

This research presents an approach to organize an unstructured collection of autonomous agents into a cooperative sensor network spontaneously. Furthermore, intelligent control is achieved through instantly populated set of searching agents, followed by natural biological Ant systems. A set of independent searching agents called *ants* cooperate to find distinct sensor-events with the shortest possible routes concurrently. Ants cooperate using an indirect form of communication mediated by pheromone. Ants update pheromone on the edges of the network as local variables while they are in parallel search. This allows multiple users to sense distinct events simultaneously. Overall design minimizes total energy consumption and allows self-configuring, robust, and scalable sensor network design. Proposed framework simplifies coordination overhead of the network and facilitates the implementation of efficient, adaptive Ant based algorithm.



To my parents
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