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Intelligent Control of Distributed Decision Agents

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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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August 2007

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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.

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To my parents

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Acknowledgements

Support for this research was provided by the Department of Electronic and Telecommunication Engineering, Post-Graduate Research Lab, University of Moratuwa, Katubedda, Sri Lanka, during the period of October 2002 to August 2007.

I would like to begin by thanking Dr. Chulantha Kulasekere, my research supervisor. He has been a wonderful supervisor, providing me with support, encouragement, and endless ideas. His breadth of knowledge and his enthusiasm for research amazes and inspires me. I thank him for the countless hours he has spent with me, discussing everything from research to my academic career choices, and critiquing my presentations. His assistance during my time at the research group has been invaluable and it has been enriched my life academically, intellectually, and personally.

I would also like to thank Professor R. M. A. P. Rajatheva, my research coordinator. His enthusiasm for research and his vision for the future have been an inspiration. He has given me support and encouragement, and his advice and feedback about my research have greatly enhanced and strengthened the study. I thank him for all the time and energy he has invested into my work.

While at the research lab, I had the privilege of interacting with wonderful, bright, and talented people. They have taught me much, and their advice, feedback, and friendship have made my research experience more educational. I would specially like to thank Mr. A. T. L. K. Samarasinghe, Dr. D. A. I. Munindradasa, Professor I. J. Dayawansa, Professor S. A. D. Dias, Dr. K. G. P. Dharmawardana, Dr. R. P. Thilakumara, Dr. A. A. Pasqual. I also wish to extend thanks to my friends and colleagues who were invaluable in completing this study.

I am indebted to my parents, for the guidance that they have given to me. They taught me the value of knowledge, the joy of love, and the importance of family. They have stood by me all the time, providing constant support, encouragement, and love. Finally, I would like to thank my sister Nimanthi and my brothers for all their love and support. I am very lucky to have such a wonderful family.

I have enjoyed sharing my research experiences with all of you!

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