Exploiting Bulk Agent Approach for Conflict Resolution in Multi Agent Systems

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Declaration

I declare that this dissertation does not incorporate, without acknowledgment, any material previously submitted for a Degree or a Diploma in any University and to the best of my knowledge and belief, it does not contain any material previously published or written by another person or myself except where due reference is made in the text. I also hereby give consent for my dissertation, if accepted, to be made available for photocopying and for interlibrary loans, and for the title and summary to be made available to outside organization.

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Abstract

Multi Agent Conflicts are costly but inevitable when autonomous agents operating in Single Multi Agent System to achieve their own goals. However in some circumstances, certain conflicts could not be resolved or remain unresolved for long time consuming large amount of time and resources. There are two types of conflicts in multi agent system. Firstly, conflicts on resources, would occur when agents interact and compete to utilize a limited amount of resources. Secondly, the conflicts on knowledge, results in a multi agent system where agents knowledge on their environment is limited, so that their interactions would be based on different knowledge levels. Therefore various conflict resolution techniques were presented in the literature. Argumentation Based Negotiation (ABN) with conflict evading and re-planning has been considered as one of the best approach so far.

In developing a novel strategy for conflict resolution in MAS, we have been inspired by cosmological studies on how natural systems manifest their existence. How brane particles interact each other in a universal extra dimension (bulk) and share the same governing rules such as gravity is the main inspiration for our research. In fact the same phenomena can be observed in philosophy as well. Our first motive is to find a model which improves the potential of conflict evading, whereas the second motive is to resolve conflict consuming less amount of time and resources. We would like to present a Multi Agent Environment Structure which satisfies our motivations.

We have implemented our agent structure in a Multi Agent Marketplace where seller and buyer agents interact together to reach to a common consensus on the prices of selling items. Successful transactions and failed or unnecessary communications are the main measuring factors on the state of the nature in our agent society. To analyze the computational usages, we also monitored the CPU, Memory and Active Threads due to asynchronous communication. Based on the repeated combination of experimental results and cosmological and philosophical studies, we postulate that conflicts in MAS can be resolved with minimal amount of time and effort, by an upper level agent called bulk agent which is supported by the knowledge and control of the dimension higher than the other operating agents, which are called brane agents.

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