E-Learning Agent System with argumentation based negotiation

Jonathan Keele – CS Student
CMS Department
Email: jon18@phoenix81@yahoo.com

Dr. Hong Lin – Advisor
University of Houston
Downtown Campus

1 Abstract

The ultimate goal of this project is to formulate a formal system for creating multi-agent systems (MAS) so that one is no longer has to rely on the use of a high level specification language. This will be accomplished by creating a gamma calculus parser and running the parser on a prototype to formulate a method for a formal system of creating multi-agent systems. As it stands, a prototype E-Learning MAS has been created and a preliminary Beliefs-Desires-Intentions (BDI) model, using argumentation based negotiation, has been created. This poster focuses on the work done to create the BDI model using argumentation based negotiation and the E-Learning MAS.

2 Problem Formulation (Architecture)

A necessary part of the project was coming up with the architecture for the integrated multi-agent system. This means that the E-Learning (MAS) to be created would have to connect to its logic counterpart. Since AgentSpeak(L) is a language which allows ease in the creation of a BDI architecture, and the Jason parser for AgentSpeak(L) allows the use of custom Java code, it was decided to use this to create the BDI model. Thus the E-Learning MAS model which was created in C++ could easily connect with the logic counterpart.

The Architecture that was designed for the implementation of argumentation based negotiation is as follows: The BDI of each agent is created and stored in Jason parser run over multiple machines using SACI (another technology integrated into Jason). Each agent gets its own corresponding BDI agent which handles the negotiations through Jason in AgentSpeak, which is triggered when a client sends a proposal through the browser. These BDI agents resolve a negotiation and then prompt an internal action. Once the Jason parser encounters different custom internal actions, it is alerted through Java to establish a connection to the worker agents (agents of the E-Learning MAS) and give them the go ahead command. These agents are the corresponding appendages in a sense for the BDI agents, in which they enact the command to manipulate data in a database such as registering a student for a class. The important overall agents in this architecture is: registrarAgent, instructorAgent, studentAgent, MasterControlAgent. Below is a view of the Architecture.

3 Implementation

Implementation on this project is divided into two parts. Creation of the E-Learning Multi-Agent System, and creation of the Argumentation Based Negotiation Model.

E-Learning Multi-Agent System: This model was created using MPI and modeled in the Gamma Language by Sean Beard, another student for his senior project. During the Summer of 2003, as researcher for the scholars academy, it was my job to convert his program to run on Linux as well create the client/server code to run it as a server for web based applications. Also in this task I removed several bugs that prevented ideal execution of the program as well as to review the model. Below is a view of this program’s distributed agents.

4 Implementation Cont.

BDI System based on its current BDI. For example, the instructor agent’s intention and desires correspond to teaching certain classes while the student agent’s intentions and desires correspond to him enrolling in a class. When an agent communicates with the other, their proposal is reviewed according to the current BDI of the reviewing agent, and based on this, a plan of action is followed. When the instructor sends a proposal to teach a class that cannot be taught, the registrar agent looks up in its BDI that the class is restricted and looks for a plan where this is true in the BDI. Once the plan is found, he creates and interaction with the instructor telling it to find a plan of action where the no signal has been reached.

5 Program Snapshots

Figure 3: E-Learning MAS

Figure 4: Argumentation based Negotiation Model

6 Ongoing Work

- Make the BDI architecture structure more intensive
- Integrate the BDI argumentation structure with the E-learning MAS
- Develop the gamma calculus parser
- Run experiments on the integrated E-learning MAS with argumentation based negotiation

7 Acknowledgements

Special Thanks to:
- NSF Grant CNS-0540592
- The Scholars Academy at UHD
- The UHD CSDS office
- Sean Beard and Dr. Hong Lin

8 References

[1] Borlotti, Rafael H. and Hubner, Jorn F. BDI Agent Programming in AgentSpeak Using Jason (Department of Computer Science, University of Durham).

