Work in Progress - Agent Based Social Simulations By Cross-Cultural Student Teams

Alfonso Duran, Rahul De, Isabel Garcia, Esmeralda Giraldo and Manuel Castro
duran@ing.uc3m.es, rahul@iimb.ernet.in, igarcia@ing.uc3m.es, egiraldo@ing.uc3m.es, mcastro@ieec.uned.es

Abstract - Intelligent software agents are particularly well suited for the simulation of complex collective behavior and interaction. Agent Based Social Simulation (ABSS) is currently being used within a multi-year, multi-university research project to develop a flexible benchmarking platform on which to test customer-facing algorithms. Along the process, the educational potential of the approach has become apparent. Given the user friendliness of the existing open source development environments, carefully designed assignments for the development of specific chunks can be carried out in a timeframe compatible with normal graduate coursework. However, operating within the framework of a project encompassing institutions in such different cultural environments as India and Europe enables taking advantage of the broader perspective it provides to design collective, interacting assignments, in which each student’s ABSS interacts with the others in a meaningful way. This project is modeled upon prior rewarding experiences by the research team in cross-cultural student teams in other environments. It involves combining students attending courses in each partner university in integrated assignments, interacting over the internet. This cross-cultural educational experience could be fine-tuned to focus on various potential development opportunities, ranging from the technological to the capability development. The fact that what they are simulating are social systems, which students from different cultures are likely to model very differently, will further raise their awareness of diversity and develop their skills to harness its positive potential.

Index Terms – Agent based social simulation, cross-cultural education, project-based training, multicultural teams.

INTRODUCTION

Intelligent software agents are particularly well suited for the simulation of complex collective behavior and interaction. Therefore, one of the fastest growing subsets within social simulations is Agent Based Social Simulations (ABSS). In ABSS, artificial agents are placed in a computer simulated environment (with or without direct interaction with humans) and their behavior is observed and analyzed [1]. Agent Based Social Simulation (ABSS) is currently being used within a multi-year, multi-university research project to develop a flexible benchmarking platform on which to test customer-facing algorithms (e.g. Revenue Management algorithms used for the dynamic pricing of air tickets or hotel rooms) [2].

The software agents based part of the project currently involves faculty members from Spanish universities (mostly from the Engineering School of the Universidad Carlos III de Madrid, UC3M) and the Indian Institute of Management, Bangalore (IIMB). In addition to this research cooperation, these faculty members: a) involve their graduate students in ABSS project assignments, in some instances linked to the research project b) visit each other’s institution (as visiting professors), thus having the opportunity to directly interact with the counterpart’s students c) are involved in pedagogy innovation projects, fostered, in the Spanish case, by the ongoing project of convergence to the Common European Higher Education Space, that requires a higher focus on student-centred “active learning”. Along the process, the educational potential of the approach has become apparent.

EDUCATIONAL POTENTIAL OF ABSS VS. OTHER SIMULATION ENVIRONMENTS

ABSS can be a valuable educational tool on its own merits, and it has been used as such by the authors in the past. Given the user friendliness of the existing open source development environments, carefully designed assignments for the development of specific chunks can be carried out in a timeframe compatible with normal graduate coursework and still provide students with the thrilling hands-on experience of developing a functioning ABSS.

This is particularly applicable in engineering management programs, or in business courses aimed at students with engineering backgrounds. Conventional discrete event simulation environments such as Arena or Witness are well suited for simulating highly structured systems such as manufacturing or logistics networks, and are therefore also used by the authors while teaching those subjects. However, the ability of ABSS to simulate complex collective behavior and interaction extends its applicability to less structured socio-technical systems, such as those in which a key element is the reaction of various distinct customer populations to the evolution over time of action variables such as prices, availability or quality levels (as in the research project mentioned above).
CROSS-CULTURAL ABSS

However, operating within the framework of a large-scale research project encompassing institutions in such different cultural environments as India and Europe offers opportunities to go beyond this initial, highly motivating but still somehow limited educational experience.

Besides the inherent benefits (and challenges) of involving master and doctoral students in a large-scale research project, such as motivation, higher interaction with faculty members and hands-on research exposure (but also potentially conflicting timeframes, overspecialization and increased research project risk), this paper will focus on the current project to expand the current distributed approach with the creation of intentionally cross-cultural student teams.

In the initial stages of the project, students have worked on ABSS assignments either individually or in teams of students from the same institution. Limited international, cross-cultural exposure has been provided through the interaction among participating faculty members (that, for example, helped to shape the ABSS assignments handed to the students) and by direct interaction with students of the partner institution during the faculty member’s stints as visiting professors. This next stage aims at exploiting the broader perspective it provides to design collective, interacting assignments. Under this approach, either the ABSS is designed and developed by a cross-cultural student team or each student’s ABSS assignment interacts with the ABSS developed by students of the other institution in a meaningful way.

The avenue currently being explored is modeled upon prior rewarding educational experiences by the research team in cross-cultural (USA - Spanish) student teams in other environments [3]. It involves, taking again advantage of the conditions created by the project, combining students attending courses in universities in geographically and culturally distant locations in integrated assignments, interacting over the internet. The educational experience offered by this collective ABSS by cross-cultural students could be fine-tuned to focus on various potential development opportunities, ranging from the technological to the capability development.

Out of those listed by Accreditation Board for Engineering and Technology (ABET) in the USA [4], capabilities whose development can be fostered by this approach include “an ability to function on multi-disciplinary teams” and “understanding the impact of engineering solutions in a global, economic, environmental, and societal context”.

In addition to the value inherent to experiencing teamwork in intercultural environments, the fact that what they are simulating are social systems, which students from different cultures are likely to model very differently, will further raise their awareness of diversity and develop their skills to harness its positive potential. The project’s experience so far suggests separating out the design and implementation stages. Students who are new to ABSS invariably have more difficulties with the design rather than the implementation; on the other hand, cross-cultural influences are more likely to be relevant in the design stage.

Therefore, participants in the next stage will undertake design-focused ABSS projects jointly carried out by student teams from UC3M and IIMB. The main objective of the project is that participating students attain the abovementioned skills and capabilities. Additional goals include strengthening the cooperation among UC3M and IIMB, developing useful methodological approaches that can be applied in follow-up projects and evaluate how social simulations developed by cross-cultural student groups differ from those developed by more homogeneous teams.

DISCUSSION

The project presented in this WIP paper builds upon both the authors’ previous educational experiences in cross-cultural student teams and the educational use of ABSS in a current international research project. By intentionally fostering hybrid Spanish – Indian student teams and interacting assignments the project intends to develop specific capabilities and international exposure and awareness among participating students, as well as to explore cultural influences on the way social systems are modeled and designed.

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REFERENCES


