Refining a Framework for Group Improvisation Using Swarm Behavior

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This summer Grace Handler and I worked with Professors Stephen Majercik and Frank Mauceri to improve the performance of Swarm-PI, a computer system that allows a human musician to interact with the computer to create music in real-time. Rather than outputting tonal responses, an area that has already been explored significantly by other programs, Swarm-PI uses emergent swarm behavior to respond to the human musician in an abstract and gestural way. This provides the opportunity for interactions not limited only to pitch, but also timbre, noise, and other musical gestures.

This summer, our goal was to improve the existing Swarm-PI program. One of the major issues with the older implementation was that it was written in Java and a superclass of Java called Processing. The interface and sound was done in a software program called Max (a C-based program) and in order for Max to interact with Processing, information and messages had to be passed through a program called Open Sound Control (OSC). This code ran, but because of all of the programs information needed to pass through, it was slow and was very difficult to debug. Over the summer, we rewrote the code so that everything is done in Max rather than passing information back and forth between many programs. This proved to be a great success, as the program now runs significantly faster and is confined to one program rather than three. The inclusion of all the code in the Max environment also makes further development of the project easier as Max is better suited to the project and easier to work with than the combination of programs used previously.

In addition to rewriting the code, we also did a significant amount of research on ways to improve the program's interaction with the human musician. Many of the papers we read focused on simulating 'creativity' and 'interestingness' in an artificial agent (in this case, Swarm-PI). We also met as a group weekly to discuss the ideas we researched, and to propose new ones. This proved to be a great project for me, because I am a Computer Science major with a strong interest in Artificial Intelligence, so our research and discussions have given me a lot of ideas of how to further improve the program. Additionally, by rewriting and debugging the code, I developed a good understanding of how the program works and what can be improved. I hope to incorporate what I have learned this summer as an independent study this coming year.

I will be demonstrating Swarm-PI in the fall at the President’s Science Symposium. Although the system is not yet set up to simulate improvisation with a human musician, we have hooked up sound to the program so that one flock generated sounds of extinct birdcalls and the other generated sounds of people speaking extinct languages. This was a very interesting demonstration and it not only showed the potential of the research, but also was rewarding to see the work we did this summer being used.

Faculty Mentor: Stephen Majercik

Funded by the Kibbe Fellowship