Michael Musick
Jonathan P. Forsyth
Rachel Bittner

The Harmonically Ecosystemic Machine

Sonic Space No. 7;

an Installation
for Interactive Improvisational
Sonic Ecosystem

(2014)

THE HARMONICALLY ECOSYSTEMIC MACHINE

Sonic Space No. 7;
an Installation for Interactive Improvisational Sonic Ecosystem
(2014)

SUMMARY

The Harmonically Ecosystemic Machine – Sonic Space No. 7; is an interactive music performance system building on the combined work of the three contributing artists/researchers. This piece invites participants to contribute musically by playing the instruments placed throughout the active space. In doing so, they join the system as collaborators and interrelated musical agents. In essence this creates a chamber work, in both senses of the word: the piece becomes an improvisational chamber work between the system and participants, and a work that activates the entire physical chamber it is installed within.

FULL NARRATIVE

The Sonic Spaces Project is an ongoing series of interactive sonic ecosystems that build a complex dynamical system between a physical space, a computer music environment, and external participants. These pieces have been presented as both concert and installation pieces.[1] These pieces create an ecosystemic relationship amongst all of the contributing human-agents and digital agents. This is accomplished through a major change in typical interactive music performance system's interface. In a typical interactive music system, the interface is usually a physical device that a performer directly manipulates or a microphone that picks up only the sound of a performer's close-mic'd instrument. In this way, the performer is free to manipulate the system however s/he sees fit, and has the option of completely ignoring the the system. Sonic Ecosystems shift the computers perception of the external world from a performer only view to a room-wide view. This is accomplished by placing microphones throughout the entire space, thereby allowing the system to use sonic energy from all participants in the space at the same time, including the system's own sonic output. This creates a complex relationship between all of the elements of the system, and by changing any one element, the musical output of the entire system changes.

The FST Project is an actively developing improvisational accompaniment machine, which has been ongoing for the last three years. This piece uses a Python interface to the OpenFST Finite State Transducer (FST) toolkit to produce harmonic accompaniment based on tracked melodies occurring in the room. An FST is a finite state machine that maps sequences of input symbols to sequences of output symbols. Here, the input sequences consist of melody notes, and the output sequences consist of chord sequences. The training data used to construct the FST is a database of transcriptions of the melodies and chord sequences of pop/rock songs. In addition, another FST is used to produce the dynamics and rhythms used in the piece. In this case, the machine is trained with the dynamic and rhythmic patterns used in a collection of Mozart compositions. Both FSTs can be constructed using different sets of training data (e.g., jazz lead sheets), and the output of the machines will reflect the harmonies and rhythms of the training data. Thus, the system can produce any number of different musical aesthetics.

This piece builds on the work of both of these artistic research projects. The installation is structured after the ecosystemic principles developed for the Sonic Spaces Project. The analysis, decision-making, and output of the system have been composed around the improvisational machines from the FST Project. This work listens to the entirety of the space for melodically significant lines, rhythmic and tempo qualities, dynamics, and harmonic motion. These qualities are captured by the system and stored for future musical material. These features are also fed to the FST and the output of this machine is used to produce a 5-agent accompaniment that uses the stored sonic history of the room as the musical material. The emergent music is a result of the interrelationships between the digital-agents, room, and human-agents.

---

[1] Examples and videos of these installations can be explored from the following website:
michaelmusick.com.
Steinhardt.nyu.edu/marl

TECHNICAL DETAILS

This system can be installed in any medium sized room (anything from 15' to 50'). The work is for a 5.1 system, where the speakers are set up equidistant from each other. One speaker will need to have an LFE directly below it, as it will serve as the "Bass voice".

Depending on the size of the space, 1-4 microphones will be used to capture the sonic energy. Ideally, these would be suspended from the ceiling; however, traditional microphone stands that can be raised at least 10' will be suitable if this is not possible.

In order to encourage participation, the installation also includes a number of instruments; such as imbiras, toy bells, small monophonic synthesizers, a toy guitar, tingsha bells, toy pianos, etc. These too would ideally be suspended from the ceiling so as to invite participants to come play them. However, if this is not feasible, instrument pedestals may be substituted. Please see diagram for an example setup.

The artists will also provide signs encouraging participation. These will include technical details of what is occurring (such as code, schematics, and narratives), colorful quotes of encouragement, and starter ideas to inspire music making. Again, these ideally would be suspended from the ceiling; however, if necessary they can be placed on the walls around the space.

A single computer and audio interface will run the system. A secure location in the room such as a locking computer box or locked adjacent control room will be required.

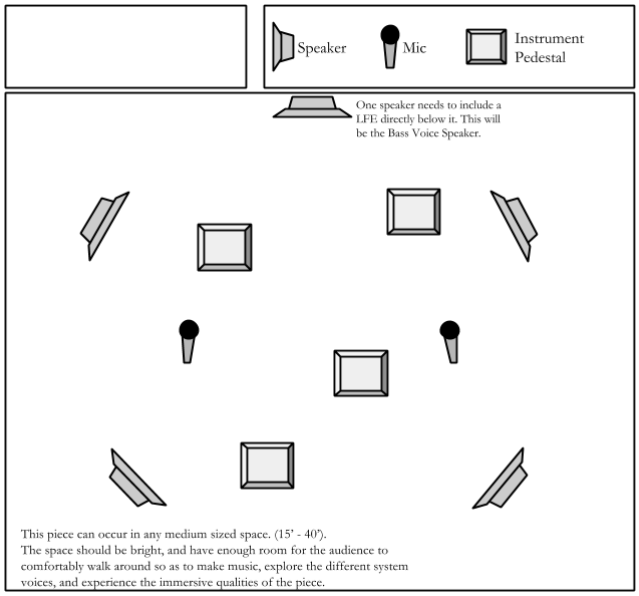
Equipment List

Provided By Artists

1. Mac Computer
2. Audio Interface
3. High quality omni-directional microphones
4. Instruments for participants
5. Descriptions, music starters, and other signage

Provided By Conference Organizers

6. 5.1 audio system with stands
7. Means to suspend or stands for microphones
8. Means to suspend or pedestals for instruments
9. Means to suspend or tape to hang signs
10. Secure area for computer and interface
11. XLR cables from microphones to computer
12. XLR cables to speakers from interface



SCORE / SCHEMATIC

The following is a set of overview schematics representing the composition. We follow the Blackwell and Young model of *PfQ* modules.