Somax2 – A Distributed Co-Creative System for Human-Machine Co-Improvisation

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Abstract. Somax2 is a multi-agent interactive system, based on machine-listening, machine learning and generative units, performing live machine co-improvisation with musicians. The system is trained on any musical materials chosen by the user (Audio or MIDI), effectively constructing a generative model, a corpus, from which it draws its musical "knowledge". Listening to and adapting to a musician, that activates dynamic profiles, Somax2 provides stylistically coherent improvisation in real-time. As part of the REACH project, defining co-creativity as distributed agency between human and machine, Somax2 is indeed a good example of a distributed co-creative system, where multimodal cross-feedback affects collective behavior and increases player's engagement through emotion and motivation.

Keywords. Machine learning, Co-improvisation, Audio Features, Co-creativity, A.I., Interaction Paradigms, Multi-agent systems

1. Introduction

Somax2 [1] is a multi-agent interactive system performing live machine co-improvisation with musicians, based on machine-listening, machine learning and generative units. The current version [2] is a recent development and algorithms improvement from the former Somax version and previous work in RepMus team [3, 4, 5, 7, 8]. It has been totally rewritten from (never released) Somax, one of the multiple descendants of the well-known Omax [3] developed in the Music Representation team over the years and offers now a powerful and reliable environment for co-improvisation, composition, installations, etc.

2. Somax2 Model and Implementation

Somax2 is one of the improvisation systems (Omax, DICY2, Improtech, Djazz) descending from the well-known Omax paradigm (learn/model/listen/generate) [3], presented here in a totally new implementation. Somax2, as its siblings, is conceived to be a co-creative partner in the improvisational process, by providing distributed agency between human and machine [1].

The system is initially trained on any musical materials chosen by the user (Audio or MIDI), effectively constructing a generative model, called a corpus.

After the first "learn" and "model" stages, the "listen" and "generate" phases are based on a navigation model, consisting of a dynamic multilayer n-gram matching and selection scheme, applying a short-term harmonic and melodic memory model [1].

When a musician interacts with the system, a similar process of segmentation and multilayer analysis is computed in real-time on the input stream. At each point in time, this is matched to the information in the navigation model, generating activations, or peaks, at certain points in the sequential memory, where the input corresponds to the model [1]. Memory and live musical data are matched through a representation space (latent space) resulting from one-off training over a large set of music pieces spanning four centuries and capturing textural relationships based on chroma analysis. Original latent space was a SOM (Self Organizing Map) and experiments have been carried with a VAE (Variational Autoencoder) showing a slightly better performance when compared with a Tonnetz as ground truth [6]. Thus, agents provide stylistically coherent improvisations based on learned musical knowledge while continuously listening to and adapting to input from musicians or other agents in real-time.

Somax2 adds a totally new versatility by being highly reactive to the musician's decisions, and by putting its creative agents to communicate and coordinate in the same way. Thanks to cognitively inspired memory model/ interaction strategies, and finely optimized concurrent architecture, that make all its units smoothly cooperate together and participating in a diversity of live co-creative interaction with musicians in improvisation, composition or installation scenarios.

Defining co-creativity as distributed agency between human and machine [1], Somax2 is indeed a good example of a distributed co-creative system, where multimodal cross feedback affects collective behavior and increases player's engagement through emotion and motivation.

Written in Max and Python [2], Somax2 features a modular multithreaded implementation, new UI design with tutorials and documentation [1]. The new 2.5 version, it is presented, in Max (©cycling74), both as an application (plug and play abstractions) and a library, allowing the user to program custom Somax2 patches in order to design one's own environment and processing, involving as many modules are needed.

Somax2 allows detailed parametric controls of its agents and can even be played alone as an instrument in its own right, or even used in composition workflow.

3.   Somax2 Demo Proposal

This demo presentation will introduce the software environment, demonstrate its learn/model/listen/generate phases, explain the basic and advanced controls in the user interface, and allow people to interact and play with it. See video resources, tutorials and demos at [1].

4.   Project Context and Credits

Somax2 development by Joakim Borg, Somax created by Gérard Assayag and Laurent Bonnasse Gahot.

Somax2 is part of the research projects ANR MERCI (Mixed Musical Reality with Creative Instruments) and ERC REACH (Raising Co-creativity in Cyber-Human Musicianship) of the European Union's Horizon 2020 framework. PI: Gérard Assayag.

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