The Continuator Strikes Back: a Controllable Bebop Improvisation Generator

François Pachet[1]

[1] Sony CSL-Paris, 6, rue Amyot, 75005, Paris, France
pachet@csl.sony.fr

Abstract. The problem of modeling improvisation has received a lot of attention recently, thanks to progresses in machine learning, statistical modeling, and to the increase in computation power of laptops. The Continuator (Pachet, 2003) was the first real time interactive systems to allow users to create musical dialogs using style learning techniques. The Continuator is based on a modeling of musical sequences using Markov chains, a technique that was shown to be well adapted to capture stylistic musical patterns, notably in the pitch domain. The Continuator had great success in free-form improvisational settings, in which the users explore freely musical language created on-the-fly, without additional musical constraints, and was used with Jazz musicians as well as with children (Addessi & Pachet, 2005). However, the Continuator, like most systems using Markovian approaches, is difficult, if not impossible to control. This limitation is intrinsic to the greedy, left-to-right nature of Markovian music generation algorithms. Consequently, it was so far difficult to use these systems in highly constrained musical contexts. We present here a prototype of a fully controllable improvisation generator, based on a new technique that allows the user to control a Markovian generator. We use a combination of combinatorial techniques (constraint satisfaction) with machine-learning techniques (supervised classification as described in Pachet, 2009) in a novel way. We illustrate this new approach with a Bebop improvisation generator. Bebop was chosen as it is a particularly "constrained" style, notably harmonically. Our technique can generate improvisations that satisfy three types of constraints: 1) harmonic constraints derived from the rules of Bebop, 2) "Side-slips" as a way to extend the boundaries of Markovian generation by producing locally dissonant but semantically equivalent musical material that smoothly comes back to the authorized tonalities, and 3) non-Markovian constraints deduced from the user's gestures.

Keywords: music interaction, virtuosity, doodling.

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