PhD thesis proposal: Web Programming for Music Makers

Inria, Collège de France

supervisors: Arshia Cont, Manuel Serrano, Gérard Berry

2015-2018

1 Facts

location:	Ircam, Inria Sophia Antipolis
funding:	36 months
date:	2015 - 2018
supervisor:	Arshia Cont, Manuel Serrano, and Gérard Berry
pdf:	these-music.pdf

2 Subject

This PhD project aims at fostering high-level music/audio programming and performance on the Web.

With the advent of the WebAudio API (`http://www.w3.org/TR/webaudio/`), high-level programming of audio and music signals has become common ground in all browsers. The current state of WebAudio focuses on some aspects of music and audio computing. The focus has been put on small-scaled engineering techniques that can deal with some class of problems well, but perform poorly at the integrated system level. Less attention has been devoted to the design of architectures for human-level musical interaction. An outsider might regard Audio Programming on the Web as a chaotic array of attempts to exploit early web-based attempts on the subject, with limited concern for designers of systems dedicated the act of music making.

This confusing situation for music/audio designers is to due to unresolved scientific challenges that will be tackled in this PhD project for Digital Music Making on the Web:

1. Performing music is real-time by nature. It demands synchrony between software modules, and, for interactive music, synchrony between the physical and software worlds.

2. Any digital music requires composition of heterogeneous models of computation (local or distributed) where orchestration among services is crucial both for authoring and execution.

   Theoretical grounds for tackling the above problems are under development in other fields that can partially address above challenges: The HipHop web orchestrator developped by INDES Team at Inria brings synchronous reactive programming to web programming to ease programming rich and complex web application but whose theoretical foundations applied to heterogeneous timed music and audio processing is yet to be explored. The Antescofo programming language, developed for host environments in PureData and MaxMSP real-time programming environments, combines musical semantics with that of embedded real-time programming languages to allow expressive programming of complex interactive musical setups and guarantee

their real-time performance. Despite their different usage paradigms, both have common roots in synchronous reactive programming paradigms and provide an ideal research environment to tackle music and audio programing on the Web.

3 Context

This PhD project will be conducted in conjunction between the MuTant project-team (Paris), the INDES project-team (Sophia, Nice), and Collège de Fance (Paris).

The MuTant project-team conducts research on synchronous real-time programming and processing of music signals, as a joint venture between IRCAM, Inria, and CNRS. Its principal research focus is on coupling of artificial perception (machine learning) with real-time synchronous programming to enable high-level musical interactions between software and the physical world. MuTant is home to the award-winning Antescofo software.

The INDES project-team conducts research on the programming of network-based diffuse applications, of which Web 2.0 applications are a notable example. These new applications emerge from the convergence of broad network accessibility, rich personal digital environment, and vast sources of information. INDES contributes to the whole chain of research on models and languages for diffuse computing, from the study of foundational models and formal semantics to the design and implementation of new languages to be put to work on concrete applications. The team is committed to develop and maintain Hop.js and HipHop.js two complementary languages for programming diffuse applications on the Web.

4 Skills

- Masters in Computer Science or New Media with strong computer science background
- Background in Audio Signal Processing and Computer Music
- Strong Background in Javascript and C
- Musical skills