

MusicALife Composition: An Alternative Representation for Musical Notation

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How can computer-based systems help people compose music — especially if they have no prior musical training?

The history of composition is interwoven with the history of music notation. And for many people, learning and mastering conventional notation systems is itself a barrier to composition. We are investigating this problem by asking the question: what could music composition look like if it was invented now — in the age of computers — rather than during an era dominated by pen and paper? Our initial result is a system — *CompositionALife* — that combines insights from end-user programming and artificial life.

There have been a number of attempts to create computer-based systems that help novices compose music. In terms of helping beginners over the threshold of learning, using, or understanding aspects of conventional Western composition (e.g., notation, harmony, etc.), some have concentrated on ways in which computational representations and interfaces can make musical composition more accessible^{8,4} while others the use of AI for intelligent tutoring.⁶ There has also been work to extend the notion of “composition” beyond traditional model of using pen and paper to score a composition performed by others. This has included work that blurs the distinction between composition and performance⁵ and that has concentrated on providing intuitive or learnable controllers.^{2,7} One interesting approach is to transform the metaphor of composition: to conceive of it as, for example, creating and interacting with “artificial life” forms. Work in this has largely been for professional musicians (e.g., ¹), but there are some notable exceptions, such as Toshio Iwai’s wonderful programs for children (*Music Insects*, *Sound Fantasy*, *SimTunes*, and *ElectroPlankton*).³

Transforming the compositional metaphor into the creation and execution of artificial life simulations has a number of advantages. In particular, much like the Logo Turtle,¹⁰ it leverages some things that *users already know* (well-developed intuitions about creature movements, interactions, and the like). But having a system in which users can create and interact with sound-producing creatures runs the risk of being nothing more than a complex piano; that is, an instrument that produces sound via interaction, but does not otherwise facilitate the development of compositional intuitions. Furthermore, although it is important to add musical structure to the world-elements and behaviors, for a real-time system it will not be sufficient. To be sure, the results can be pleasing if the system has such things as melodic phrases associated with creature-movement.

But we believe that for compositional systems — as for systems that support artificial life research — there need to be mechanisms for specifying different complex behaviors and interactions, for pausing and inspecting a simulation, and for modifying different aspects of the simulation as a result of seeing/hearing it in action. We are also interested to see if the *ability to specify world-characteristics and behavior* (and observe/hear the resulting simulation) will contribute to the development of compositional intuitions and the creation of interesting musical works.

As such, we have been developing a *CompositionALife* system (an initial version was completed in 2004⁹ and we have recently renewed work on it). There are two categories of intended users for the system: designers of compositional *genres* (e.g., Schoenberg’s twelve-tone technique, boogie woogie blues, etc.) — and composers who would then create specific *works* within a particular genre. Using our system, creators of compositional genre create an artificial life “world” (of creatures,

environmental features and phenomena, and interaction rules) that provides an acoustic structure for artificial life simulations. Composers then create musical works by creating specific simulations.

For example, a genre designer specifies such things as the types of creatures and world entities and their attributes (e.g., position, size, speed, age). The genre designer also specifies the *musical* characteristics of different world locations and events (creature movement, meetings, reproduction, death, etc.). The combination of these features constitute a *CompositionALife* genre and are saved as a “world.” A composer can then load such a world and begin to create a specific *CompositionALife* composition (simulation), specifying the number and types of creatures and world elements, their starting locations and headings, and the like.

The current version of *CompositionALife* raises several different kinds of issues.

In terms of end-user programming, the system needs quite a bit of work to make it more friendly. Currently, genres and compositions are created using a simple Logo-like end-user language — and users are able to inspect the state of different world elements by right-clicking on them. But we need to revise both the language and the GUI in ways that simultaneously increase the expressive power and the ease of use.

In terms of musical composition, although initial work with novice composers (as opposed to genre designers) suggests that the system is reasonably easy to use, it is not yet clear how well it functions as an aid in the development of compositional intuitions. In this regard, it may be that the structure and design of a genre plays a significant role. (Indeed, the relationship between a genre and a composition is something we find ourselves constantly confronting as we work on this system.)

Beyond that, work on this system is raising some interesting questions about music composition and end-user programming. For example, musical notation systems do not (usually? ever?) include a key feature

present in most programming languages: *abstraction*. Although composers can and do invent their own musical notation systems, these do not typically embody any notion of allowing users to *build their own notational abstractions with the notation system*.

In many ways, that last point highlights one of our central hopes in working on the *CompositionALife* system: the intersection of artificial life and end-user programming can inform interesting reconceptualizations of musical composition — and transform the nature of the tools developed to support it.

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