

MUSICAT: A COMPUTER MODEL OF
MUSICAL LISTENING AND ANALOGY-MAKING

Eric Paul Nichols

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Doctoral Committee:

Dr. Douglas R. Hofstadter
(Principal Adviser)

Dr. Eric Isaacson

Dr. Donald Byrd

Dr. Michael Gasser

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For Helga and Steve

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Musicat: A Computer Model of Musical Listening and Analogy-Making

What happens when people listen to music? What sorts of mental structures are formed? How do we make sense of a melody as its notes fly by in rapid succession? Can we model the experience of listening to music in real time?

This dissertation describes the computer program Musicat, which was designed to explore these questions. Musicat is a model of real-time melody perception by people. The program “listens” to monophonic Western tonal melodies one note at a time (presented not as audio recordings, but rather in a symbolic form much like sheet music) and generates an internal representation of the musical structures it “hears”. These structures include groups of adjacent notes, meta-groups comprised of smaller groups, expectations for upcoming structures, and, most importantly, analogies between groups (and meta-groups) of various sizes. In the model, listening is not a passive process; instead, it is an active, dynamic process of creating mental structures. Thus when Musicat listens to a melody, I consider such an act to be creative, and I call it a “listening performance”.

Musicat follows in the tradition of previous computer models of the Fluid Analogies Research Group: it is based on the architectures of Copycat, Tabletop, and related programs, with modifications made to accommodate music’s temporal nature. In addition to giving a technical discussion of Musicat’s architecture, this dissertation includes copious examples of the program’s listening performances on a variety of melodies ranging from simple children’s songs to more complex popular-song forms. A discussion of the results suggests that Musicat captures several previously unmodeled aspects of musical listening, such as analogy-making and hierarchical grouping in real time, but that much more work is needed to achieve humanlike listening performances on even the simplest of melodies.

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