University of Adelaide

Elder Conservatorium of Music

Faculty of Humanities and Social Sciences

Declarative Computer Music Programming:
using Prolog to generate rule-based musical counterpoints

by

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Thesis submitted in fulfilment of the requirements
for the degree of

Doctor of Philosophy

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ABSTRACT

Declarative Computer Music Programming:
Employing unique features of the Prolog programming language
to generate rule-based musical counterpoints.

This submission for the degree of Doctor of Philosophy at the Elder Conservatorium of Music, University of Adelaide, is presented as a conventional, text-based thesis, supported by computer code and audio files.

The primary purpose of this research investigation in the field of Artificial Intelligence has been to test the capabilities of the declarative programming paradigm to generate musical counterpoints within the framework of a specially created expert system. The project has tested if such a contrapuntal expert system can evolve through a process of mutation of its own code and generate musical counterpoints that do not conform exactly with the original programming. It presents for the first time a music based study of this capacity for code self-modification.

The expert system developed for this project was constructed declaratively, using the Prolog computer language, rather than the more common imperative approach. Although it is a General-Purpose language, Prolog is particularly effective in the construction of Artificial Expert Systems, because its unique declarative programming style allows the programmer to focus on describing the problem rather than describing how to solve the problem. This leaves to the machine the task of finding the solution to the given problem. The problem in this case is how to generate - artificially - simple counterpoints to short melodic phrases drawn from the cantus firmus tradition. As part of the problem solving process the expert system was taken through a series of evolutionary experiments with Artificial Neural Networks used as a fitness function.

DECLARATION

I certify that this work contains no material which has been accepted for the award of any other degree or diploma in my name in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. In addition, I certify that no part of this work will, in the future, be used in a submission in my name for any other degree or diploma in any university or other tertiary institution without the prior approval of the University of Adelaide and where applicable, any partner institution responsible for the joint award of this degree.

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LIST OF FIGURES