

CAITLIN:
Implementation of a
Musical Program Auralisation System
to Study the Effects on
Debugging Tasks as
Performed by Novice Pascal Programmers

by

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*To what were its foundations fastened?
Or who laid its cornerstone,
When the morning stars sang together,
And all the sons of God shouted for joy?*

– Job 38:6-7

*The man that hath no music in himself,
Nor is not moved with concord of sweet sounds,
Is fit for treasons, stratagems and spoils;
The motions of his spirit are dull as night
And his affections dark as Erebus:
Let no such man be trusted. Mark the music.*

– Shakespeare:
The Merchant of Venice, V.i.

Abstract

In recent years, researchers have begun to focus on the communication of information using sound. This *auditory display* research community now has its own community and international conference (the International Conference on Auditory Display). Auditory Display embraces many interesting avenues of enquiry, one of which, *program auralisation* is the topic of this thesis.

This thesis describes how the technique of program auralisation (the mapping of computer program data and events to sound) was applied within a musical framework and context in the development of a musical program auralisation system called CAITLIN (the Computer Audio Interface to Locate Incorrect Nonsense). The motivation behind the construction of CAITLIN was to devise a system of auditory display that would assist novice Pascal programmers in debugging their code.

Prior to this thesis, almost no experimentation had been carried out into this area. Earlier systems had been developed, but there was no empirical evidence against which to judge success or failure. Experimentation was carried out to assess the suitability of the technique as applied by CAITLIN. Novice programmers were engaged in several debugging exercises both with and without the assistance of the CAITLIN musical program auralisations. The results from the experiments have suggested circumstances in which such auditory feedback may indeed be useful. Further development and experimentation needs to be carried out to explore the potential of the technique. A set of organising principles for the use of music in program auralisation has been proposed on the basis of this research and a review of earlier work in the auditory display, music cognition, and music-theoretic fields.

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