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**Expressive Musical Robots:
Building, Evaluating, and Interfacing
with an Ensemble of Mechatronic
Instruments**

BY:

JIM MURPHY

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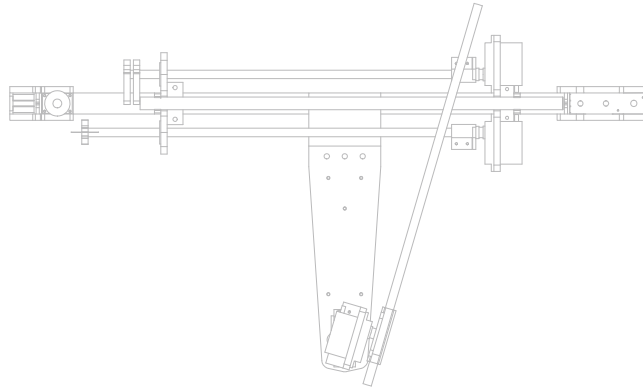
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Supervisory Committee

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- Co-Supervisor: Dr. Dale A. Carnegie (Victoria University of Wellington School of Engineering and Computer Science)

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“Merlin himself, their elderly creator, said he had devoted years to these machines, his favorites, still unfinished.”

James Gleick

Abstract

Expressive Musical Robots: Building, Evaluating, and Interfacing with an Ensemble of Mechatronic Instruments

by JIM MURPHY

An increase in the number of parameters of expression on musical robots can result in an increase in their expressivity as musical instruments. This thesis focuses on the design, construction, and implementation of four new robotic instruments, each designed to add more parametric control than is typical for the current state of the art of musical robotics. The principles followed in the building of the four new instruments are scalable and can be applied to musical robotics in general: the techniques exhibited in this thesis for the construction and use of musical robotics can be used by composers, musicians, and installation artists to add expressive depth to their own works with robotic instruments.

Accompanying the increase in parametric depth applied to the musical robotics is an increase in difficulty in interfacing with them: robots with a greater number of actuators require more time to program. This document aims to address this problem in two ways: the use of closed-loop control for low-level adjustments of the robots and the use of a parametric encoding-equipped musical robot network to provide composers with intuitive musical commands for the robots.

The musical robots introduced, described, and applied in this thesis were conceived of as musical instruments for performance and installation use by artists. This thesis closes with an exhibition of the performance and installation uses of these new robots and with a discussion of future research directions.

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To my family, friends, and teachers.