Eli Brandt

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Research Summary

I have developed the idea of *temporal type constructors* for programming with time-structured data—computer music programming, for example, and perhaps scientific computing and simulation. This idea gives programs high-level expressiveness, while retaining the generality of a low-level language, a combination which has never been satisfactorily achieved in this programming domain. My sample implementation, written in O'Caml, gives examples of algorithms that are far better expressed when temporal types are available.

Future work in this area could include an efficient implemention in terms of C++ template meta-programming, and code generation to deal better with general feedback delay networks.

My earlier work at CMU was in distributed real-time systems for interactive music. I was involved in the design, development, and maintenance of the Aura system, which has been used in an interactive multimedia planetarium show, as well as in a number of on-stage performances.

Other publications are in the areas of signal processing, performance measurement of MIDI transports, and wormhole routing in multicomputers.

Education

Ph.D. program in Computer Science 8/95 to present
Carnegie Mellon University
Thesis topic accepted by the department, November 1999.
M.S. degree received May 2001.
Expected completion of Ph.D. in May 2002.

B.S., Mathematics 9/91 to 5/95
Harvey Mudd College
Graduated with high honors,
commendation in mathematics,
commendation in humanities.

Work Experience

Summer intern 5/00 to 8/00
IBM Research, Computer Music group
Helped design a tool for a group of film-score composers,
using ambitious new ideas about interface and workflow.
Designed and built the data-browsing component of this tool.

Summer intern 5/99 to 8/99
IBM Research, Computer Music group
Developed tools and techniques for measuring MIDI timing.
Added parametric polymorphism to the type system of the visual language Sonnet,
using C++ and COM.

Summer intern 5/98 to 8/98
IBM Research, Computer Music group
Analyzed MIDI timing over alternative physical layers.
Provided documentation on the Win32 DirectShow architecture to group members.

Summer intern 5/97 to 8/97
Microsoft Research, User Interface group
Adapted old software to use current audio and timing APIs.
Developed research platform for streaming audio synthesis.
Created parametric synthesis models of rain, sleet, and other environmental sounds.

Software designer 9/94 to 5/95
AlliedSignal Automotive (Unpaid work with Harvey Mudd Clinic program.)
Acted as primary designer of a MATLAB program for
the graphical design and assessment of turbocharger blades.
Wrote the framework for the program, and the user interface.
Delivered presentations on this work to AlliedSignal and Harvey Mudd audiences.

Administrator and programmer 6/93 to 8/93
University of Massachusetts
Maintained and expanded a Windows-based network.
Wrote statistical software in Mathematica.

Mathematical programmer part-time, 9/89 to 5/91
GANG, University of Massachusetts
Developed mathematical visualization code with SunOS and Irix GL.

Refereed Publications

Eli Brandt, **"Implementing temporal type constructors for music programming"**,
Proc. 2001 International Computer Music Conference,
International Computer Music Association, pp. 99–102.

Eli Brandt, **"Hard sync without aliasing"**,
Proc. 2001 International Computer Music Conference,
International Computer Music Association, pp. 365–368.

James Wright and Eli Brandt, **"System-level MIDI performance testing"**,
Proc. 2001 International Computer Music Conference,
International Computer Music Association, pp. 318–321.

Eli Brandt, **"Temporal type constructors for computer music programming"**,
Proc. 2000 International Computer Music Conference,
International Computer Music Association, pp. 328–331.

Brandt and Dannenberg, **"Time in distributed real-time systems"**,
Proc. 1999 International Computer Music Conference,
International Computer Music Association, pp. 523–526.

Brandt and Dannenberg, **"Low-latency music software using off-the-shelf operating systems"**,
Proc. 1998 International Computer Music Conference,
International Computer Music Association, pp. 137–141.

Dannenberg and Brandt, **"A Flexible Real-Time Software Synthesis System"**,
Proc. 1996 International Computer Music Conference,
International Computer Music Association, pp. 270–273.

Libeskind-Hadas and Brandt, **"Origin-Based Fault-Tolerant Routing in the Mesh"**,
Future Generation Computer Systems, Vol. 11, No. 6, October 1995, pp. 603–615.
(Originally published in Proc. 1995 International Symposium on High-Performance
Computer Architecture, pp. 102–111.)

Interests

Didjeridu, scuba diving (PADI AOW certified), woodworking, recording electronic music.

References

Available on request.