

William M. Bricken, Ph.D.

5203 236th Pl SE, Issaquah, WA 98029 425-638-3484

www.wbricken.com

william@wbricken.com

Formal Education

- Ph.D., Mathematical Methods of Research, School of Education, Stanford University. Multidisciplinary studies in Research Methodology, Artificial Intelligence and Educational Psychology. 1987
Dissertation: Analyzing Errors in Elementary Mathematics.
- M.S., Statistics, Stanford University. Emphasis on measuring and analyzing human behavior. 1984
- M.Ed. (candidate), Educational Innovation, La Trobe University, Melbourne, Australia. Thesis: Forming and Running a Co-operative School. 1973
- Diploma of Education, Mathematics and Counseling, Monash Teachers College, Melbourne, Australia. 1972
- B.A., Social Psychology, University of California at Los Angeles. 1967
- A.A., Mathematics and Physical Sciences, El Camino College, Los Angeles. 1965

Employment History

Mathematics faculty (tenured)

Lake Washington Institute of Technology, Kirkland, Washington 2006-current

- Design and implement innovative curriculum models for mathematics education.
- Courses taught:

Prealgebra	Introductory and Intermediate Algebra
Math in Society	Elements of Arithmetic
Applied College Algebra	Discrete Mathematics
Mathematics of Design	Statistics
Introduction to Logic	Precalculus
Quantitative Reasoning	Teaching Math to Young Children

Chief Scientist and Co-founder

Bricken Technologies Corporation, Menlo Park, California 2000-2005

NETWORK OPTIMIZATION SOFTWARE for SEMICONDUCTOR DESIGN

- Provided technical leadership; wrote business plans, funding presentations, product specifications and development plans, technical reports. Raised \$500,000 in venture funding.
- Designed and implemented innovative semiconductor design models for parsing, area optimization, delay optimization, partitioning, abstraction, technology mapping, and performance parameterization of multimillion element design databases.

Assistant Professor of Computer Science and Software Engineering

Seattle University, Seattle, Washington

1996-2001

- Supervised the Master of Software Engineering program, including capstone (full year) software engineering project teams writing commercial software. Revised the Master of Software Engineering curriculum.
- Contributed to the design of curriculum, marketing, scholarship, and academic policies for Seattle University Graduate Programs; member of the Graduate Leadership Board.
- Graduate-level courses taught:

Discrete Mathematics	Applied Formal Methods
Artificial Intelligence	Computer Graphics
Human-Computer Interaction	Programming the Interface
Programming Methodology	Client/Server Architectures
Computer Ethics	Special Projects

Consultant (half-time, concurrent with academic appointments)

Interval Research Corporation, Palo Alto, California

1993-2000

FORMAL MODELS OF COMPUTATION, LOGIC SYNTHESIS, VISUAL LANGUAGES

- Contributed to the Natural Computing Project which focused on rebuilding computational theory and mechanism from first principles.
- Designed and implemented innovative algorithmic techniques for determining satisfiability; for logic processing and optimization; for Boolean factoring and minimization; for computer arithmetic; and for asynchronous parallel computation.
- Designed and implemented a set-based predicate inference engine. Applied this engine to logic and rulebase minimization, to data mining, and to logic synthesis.
- Designed and implemented innovative algorithms for transformation and optimization of large logic networks, with world-class performance on the ISCAS'91/MCNC benchmarks.
- Invented several diagrammatic formal systems that provide parallel implementation models.

Chief Technology Officer

Virtual Express Ltd., Bellevue, Washington

1994

VIRTUAL REALITY PRODUCT IMPLEMENTATION, EXPERIENCE DESIGN

- Determined product design, features, constraints, development effort, and costs. Wrote business plans, negotiated with components suppliers, and managed office.
- Conducted market research and product acceptance studies and statistical analysis.
- Led technical team, established requirements, specifications and schedules for product build. Developed on-time and within budget a cost-effective commercial prototype immersive VR system for multiple participants with real-time interactive objects.

***Research Associate Professor of Education and
Research Associate Professor of Industrial Engineering (non-salaried)***

University of Washington, Seattle, Washington 1992-1994

- Supervised graduate students in Educational Technology and in Industrial Engineering.
- Graduate-level courses taught:
 - Human-Computer Interaction
 - Management Decision Models
 - Virtual World Development

Short Course Lecturer

Various 1991-1993

- Siggraph Tutorial, 1991: Virtual Interface
- UCLA Extension 3 Day Course, 1991: Virtual Interface Technology
- NCCE Tutorial, 1992: Virtual Reality for Education
- UCLA Extension 3 Day Course, 1992: Virtual Interface Technology
- Siggraph Tutorial, 1992: Developing Immersive Systems
- Visual Languages Tutorial, 1992: Language Aspects of VR
- UCLA Extension 3 Day Course, 1993: Virtual Interface Technology
- ACM-CSC Full day Tutorial, 1993: Virtual Reality and Experiential Computation

Principal Scientist

Human Interface Technology Laboratory, Washington Technology Center,
University of Washington, Seattle, Washington 1990-1994

ADVANCED HUMAN-COMPUTER INTERACTION, VIRTUAL REALITY SYSTEMS

- Designed the computational infrastructure of the research laboratory. Solicited, selected and supervised graduate students and summer students. Wrote and negotiated proposals resulting in over \$3,000,000 of equipment and software grants.
- Developed innovative software tools for construction of, navigation in, and interaction with virtual environments. Responsible for concurrent software projects, including innovative concepts, management of the programming teams, and evaluation of software performance.
- Primary designer for the Virtual Environment Operating System, written in C and in interface languages LISP, Mathematica, Open GL, and MIDI, for distributed UNIX processors. VEOS supports multiple participants, concurrent divergent worlds, modular agent programming, autonomous entities, voice recognition, real-time interactive editing, and distributed parallelism. With G. Coco and ten other graduate students, two theses; 1989-93.
- Implemented a prototype virtual reality workstation for aeronautics applications. This system was instrumental in the Boeing Company focusing on virtual reality modeling as a primary strategic objective. Trained the initial Boeing virtual reality team.
- Applied virtual reality tools to the design and evaluation of instructional environments.

Director and Distinguished Fellow

Autodesk Research Laboratory, Autodesk Inc., Sausalito, California 1988-1989
COMPUTER-AIDED DESIGN, GRAPHICS LANGUAGES, GRAPHICS INTERFACE

- Responsible for corporate research; project plans, requirements, management and cohesiveness; software design, review and evaluation; technology presentations; and innovative concepts. Initiated, staffed and managed the Autodesk Research Laboratory.
- Projects included abstraction of large pictorial databases, real-time graphics interaction, and ontology construction. Fielded one of the first immersive interactive VR systems (6/88).

Principal Research Scientist

Advanced Decision Systems, Mountain View, California 1984-1988
ARTIFICIAL INTELLIGENCE, HUMAN-COMPUTER INTERACTION

- Responsible for project planning, management and reporting; funding proposals; technical leadership; innovative concepts; and large hunks of computer code.
- Designed and implemented these innovative software systems:
 - new algorithms for algebraic optimization of logic, written in Pure LISP and Prolog
 - an inference engine that uses imaginary logic values in the presence of contradictions
 - a formal pictorial language for querying databases of Ada programs about runtime errors
 - a constraint propagation system that outperformed other known techniques
 - a prototype instructable interface using innovative machine learning techniques
 - architectures for intelligent tutoring systems.

Intern, Consultant and Wizard

Atari Research Laboratory, Sunnyvale, California 1983-1984
USER INTERFACE and MODELS

- Research into implementation of advanced user interfaces, user models, media rooms, fractal graphics, multimedia encyclopedias, and automated browsing of large pictorial databases.

Teaching and Research Associate

Stanford University, Stanford, California 1981-1984

- Full scholarship for two years, teaching associate for the following two years.
- *Dissertation research:* Empirically validated the unique nature of errors made by students learning algebra, using a range of experimental techniques (multivariate experiment, exploratory factor analysis, protocol analysis, clinical case study, historical review, ontological deconstruction, and direct remediation).
- Graduate-level courses taught:

Computer-based Statistical Analysis	Statistical Analysis in Educational Research
Interactive Educational Technology	Intelligent Tutoring Systems

Lecturer in Education

University of Hawaii at Hilo, Hilo, Hawaii 1976-1979

- Responsible for development of courses and curriculum.
- Graduate courses taught:
Methods and Materials of Instruction Science Education
Teaching Basic Skills in Elementary School

Home Owner/Builder

Paauiilo, Hawaii 1975-1981

- Designed and hand-built a 3000 sq.ft. home on the big island of Hawaii.

Assistant Professor of Social Psychology and Education

State College of Victoria at Rusden, Melbourne, Australia 1973-1975

- Responsible for curriculum development, course evaluation, and enrollment.
- Head of Psychology Department, Acting Head of Education Department.
- Fourth-year courses taught:
General Methods of Teaching Educational Psychology
Humanistic Education Radical School Reform
Social and Personal Interaction in the Classroom
Teaching Practicum (supervised classroom student teaching for about 150 students)

Principal and Founder

Coonara Children's Community School, Melbourne, Australia 1972-1975

- Managed the daily coordination of this non-profit decentralized educational alternative for primary students. Responsible for community liaison, legal incorporation, state certification, and two substantial grants. Coonara was recognized as the leading example of educational innovation in Australia.

Secondary Teacher and Founding Member

Collingwood Annex, Melbourne, Australia. 1971-1973

- Contributed to the design and growth of this inner-city alternative high school for otherwise failing students. Taught mathematics, guidance, and science. Designed educational philosophy, learning experiences, and curricula.

Personnel Analyst, Test Research

Los Angeles County, Los Angeles, California. 1969-1971

- Basic and applied research into selection devices for County entry and promotional positions, with emphasis on test research and validation, minority differences, FORTRAN programming, general abilities measurement, and measurement theory.

Self-supported through College

Various.

1965-1969

- | | |
|---|---|
| • Oiland Service Company | leased subsurface oil rights from land owners |
| • Research Associate, Ohio State University | basic research into information disclosure |
| • Systems Development Corporation | data reduction |
| • Mattel | quality control of new toys |

Selected Professional Activities 1990-1997

Between 1984-89 and 2000-05, I worked in confidential and trade secret environments.

Boards and Committees

Associate Editor (1994-97) Presence: Teleoperators and Virtual Environments, MIT Press
 AI Expert Editorial Board
 Meckler International Directory of Virtual Reality Research and Development Editorial Board
 National Science Foundation Board of Reviewers (virtual environments, experiential programming)
 National Academy of Sciences Committee on Virtual Reality Research and Development
 National Science Foundation Invitational Workshop on Research Directions in Virtual Reality
 Executive Committee, IEEE Task Force on Multimedia Computing
 Wavefront/Alias Academic Advisory Council
 Siggraph 1991 Tomorrow's Realities Jury
 IEEE 1992 International Workshop on Visual Languages Program Committee
 IEEE 1993 Symposium on Research Frontiers in Virtual Reality Program Committee
 IEEE 1993 Visualization Program Committee
 IEEE 1993 Virtual Reality Annual International Symposium Program Committee
 ACM 1994 Virtual Reality Systems and Technology Program Committee
 ACM 1994 CHI Program Committee
 Membership: ACM, Siggraph, IEEE, CHI, AAI, CPSR

Public Addresses

German National AI Society'95	(keynote)	Distinction Networks
UW Education Colloquium'94	(keynote)	Student Errors Are Unique
World Computer Congress'94	(plenary)	Inclusive Computing
Complex Agent Architecture'94	(keynote)	Entity Modeling
Siggraph'94	(panel)	Graphics vs. Action
Siggraph'93	(panel)	VR Operating Systems
ICAT/VET'93	(plenary)	Experiential Computing
CyberArts'92	(plenary)	VRt
Visual Languages'92	(paper)	Spatial Representation of Algebra

CS and Philosophy'92	(keynote)	At the Boundary of Reality
NCCE'92	(keynote)	Virtual Reality in the Classroom
Imagina'92 Monaco	(keynote)	Progress in Virtual Reality
Meckler VR'91 California	(keynote)	Mathematical Foundations of Cyberspace
Meckler VR'91 London	(plenary)	VR Directions of Growth
Siggraph'90	(panel)	VR Hip, Hype, Hope
CPSR DIAC'90	(plenary)	VR: As Unreal as It Gets
NASA RIACS'90	(keynote)	A Vision of Virtual Reality

Publications

- W. Bricken (2006) The Mathematics of Boundaries: A Beginning. in D. Barker-Plummer et al (eds.) *Diagrams 2006*, LNAI 4045, Springer, 70-72.
- W. Bricken (2006) Syntactic Variety in Boundary Logic. in D. Barker-Plummer et al (eds.) *Diagrams 2006*, LNAI 4045, Springer, 73-87.
- W. Bricken (1995) Distinction Networks. in I. Wachsmuth, C.R. Rollinger & W. Brauer (eds.) *KI-95: Advances in Artificial Intelligence.*, Springer, 35-48.
- W. Bricken and G. Coco (1995) VEOS: The Virtual Environment Operating Shell. in W. Barfield and T. Furness (eds.) *Virtual Environments and Advanced Interface Design*, Oxford U. Press.
- W. Bricken (1994) Inclusive Symbolic Environments. in K. Duncan and K. Krueger (eds.) *Proceedings of the 13th World Computer Congress*, v3, Elsevier Science, 163-170.
- W. Bricken and G. Coco (1994) The VEOS Project *Presence* v3(2), MIT Press, 111-129.
- W. Bricken (Naoki Kobayashi and Sueki Matsumura trans.) (1993) Extended Abstract: A formal Foundation for Cyberspace. *Intercommunication* #3
- K. M. Fairchild, T. Poston, and W. Bricken (1993) Efficient Virtual Collision Detection for Multiple Users in Large Virtual Spaces. *Proceedings of VRST'93*, 56-70.
- W. Winn and W. Bricken (1992) Designing Virtual Worlds for Use in Mathematics Education: The Example of Experiential Algebra. *Educational Technology*, v32(12), 12-19.
- W. Bricken (1992) Spatial Representation of Elementary Algebra, *1992 IEEE Workshop on Visual Languages*, Seattle, IEEE Computer Society Press, 56-62.
- J. James and W. Bricken (1992) A Boundary Notation for Visual Mathematics, *1992 IEEE Workshop on Visual Languages*, Seattle, IEEE Computer Society Press, 267-269.
- G. Bishop, W. Bricken, F. Brooks et al. (1992) Research Directions in Virtual Environments: Report of an NSF Invitational Workshop. *Computer Graphics*. 26(3): 153-177.
- W. Bricken and L. Jacobson (1992) Virtual Environment Operating System, VR Special Report, 55-58.
- W. Bricken (1992) Progress in Virtual Reality, *Proceedings of Imagina'92*, Monte Carlo, 125-40.
- W. Bricken (1991) VEOS: preliminary functional architecture, *ACM Siggraph'91 Course Notes*, *Virtual Interface Technology*: 46-53.
- W. Bricken (1991) A Formal Foundation for Cyberspace. *Proceedings of Virtual Reality '91*, San Francisco, Meckler, 9-37.

- W. Bricken (1990) Virtual Reality: Directions of Growth. *Proceedings of Siggraph'90* VR panel.
- W. Bricken (1990) Cyberspace 1999, *Mondo 2000*, Summer 1990, 56-59.
- W. Bricken and E. Gullichsen (1989) An Introduction to Boundary Logic with the Losp Deductive Engine, *Future Computing Systems* 2(4), 1-77.
- W. Bricken (1986) A Simple Space, *Proceedings of the Sign and Space Conference*, UC Santa Cruz.
- W. Bricken and P. Nelson (1986) Pure LISP as a Network of Systems, *Proceedings of the Second Kansas Conference: Knowledge-Based Software Development*, Kansas State University.
- W. Bricken (1973) Coonara Children's Community School, in H. P. Scheonheimer (ed.), *Good Australian Schools*, Technical Teachers Association, Melbourne Australia, 9-14.

_____ Substantive Technical Reports 1983-2012 _____

Lake Washington Institute of Technology

- 2012: Student-centered Teaching: The Potsdam Miracle
- 2012: Making Arithmetic Meaningful
- 2012: Applied Mathematics in the LWIT Common Engineering Core
- 2012: Innovation in Community College Developmental Mathematics Education
- 2012: Helping Technological Change in the Classroom to Succeed
- 2012: Diagnostic Assessment in Math 900
- 2012: The Use of Calculators and Computers in Math Classrooms
- 2012: Preliminary Assessment of M900: Academy Sample
- 2012: Math 900 Diagnostic Questions for Math 970 and Math 980
- 2012: Math 900 Concept Map
- 2012: The Design of Math 900 (with Julia Bricken)
- 2012: The Structure of Math 900
- 2012: Math 900 Design and Curriculum Documents (with Julia Bricken)
- 2012: Core Themes Concept/Flow Maps
- 2012: LWIT Math Guidebook
- 2012: Layout for the MathLab
- 2012: Models of Departmental Decision-making
- 2012: Changes in the Developmental Algebra Sequence
- 2011: Alignment of State Standards with the LWIT Academy High School Math Coursework
- 2011: Washington State ABE Standards Mapped to the Squires Curriculum
- 2011: CASAS Math Competencies Mapped to the Squires Basic Math Curriculum
- 2011: MyLabsPlus Orientation Materials
- 2011: Changing Math 90/99 Textbooks
- 2011: Math Course Sequence Design for the Common Engineering Core
- 2011: LWTC Math Department Philosophy
- 2011: IBEST Year One review
- 2011: Math Department Finals Analysis
- 2011: Faculty Collaboration Proposal
- 2010: Vertical Course architecture

2010: Math Textbook Listing
2010: Math Textbook Survey
2010: Humane Mathematics
2010: Educational Philosophy via Krassner's Method
2009: IBEST Grant Proposal
2008: Advising Is Global Teaching
2008: The Mathematical Origins of Interest-Based Bargaining
2008: How Societies Fail
2008: Global Outcomes by Courses
2008: Multiple Levels of Analysis: Detail and Recommendations
2008: Exercises for Program Goals
2008: Some Assessment Tools and Methods
2008: Assessment Without and With Three Syllable Words
2008: Global Outcomes Matrix and Assessment Plan
2008: College-level Mathematics at LWTC
2007: Reclaiming Meaning in Mathematics (WCTCMT Conference)
2007: How Measurement Works
2007: Department of Education Grant Proposal
2007: National Science Foundation Grant Proposal
2006: American Honda Foundation Grant Proposal
2006: Design of the MathLab

Lake Washington Institute of Technology — Presentations

2012: Voting
2011: Math History
2011: The Greek Tetraktys
2011: Lattices
2011: Symmetry, Tiling, Tessellation
2011: Data Mining and Analysis
2011: Sustainability
2010: Climate Change
2010: Exponential Growth in Technology
2010: Math and Art
2010: Iconic Mathematics
2010: Chaos and Cellular Automata
2010: Networks
2010: Paleogeology
2010: Information Visualization
2010: Virtual Reality
2009: Earth from Space
2009: Tour of the Universe
2009: Exponential Growth
2009: Illusion
2009: Overpopulation
2009: Fractals

Unary Computers and Boundary Institute

- 2011: Unfamiliar Ideas
- 2011: Principles of Iconic Mathematics
- 2011: Counting Doesn't Work
- 2010: Stroke Axioms
- 2009: Design and Implementation of a Boundary Arithmetic Calculator
- 2009: Iconic and Symbolic Containment in Laws of Form (monograph)
- 2009: Lewis Carroll's Five Liars Puzzle
- 2009: A Pseudo-review of *Surmounting the Cartesian Cut through Bullshit*
- 2009: Please Don't Represent the Void
- 2008: Iconic Arithmetic Calculator (Mma code)
- 2008: Simplicity Rather than Knowledge
- 2007: Spatial Arithmetic (video animation)
- 2007: Foundations of Spatial Arithmetic
- 2007: Teaching for Innovation (East China Normal University)
- 2006: Fracturtles Update (Mma code)
- 2006: The Mathematics of Boundaries: A Beginning (Diagrams'06)
- 2006: Syntactic Variety in Boundary Logic (Diagrams'06)
- 2006: Boundary Logic and Alpha Existential Graphs
- 2006: Equality is Not Free
- 2006: Taking Nothing Seriously: A Foundational Diagrammatic Formalism
- 2005: What's the Difference: Contrasting Boundary and Boolean Algebras
- 2005: Website construction: www.wbricken.com

Bricken Technologies Corporation — Presentations

- 2004: Synthesis Applications of Boundary Logic
- 2004: BTC Board of Directors Technical Review (quarterly)
- 2002: BTC Company Overview
- 2002: BTC Investor Presentation
- 2002: BTC Marketing Presentation
- 2002: Comesh Technical Review
- 2002: Changing the Rules of Digital Design
- 2002: Comesh Progress Report
- 2002: BTC Product Design
- 2002: BTC Technical Design Review
- 2002: Technical Validation Project: Summary Report
- 2001: CM85A
- 2001: The Circuit Design Generator

Bricken Technologies Corporation — Corporate

- 2004: BTC Business Model
- 2002: Corporate Executive Summary
- 2002: BTC FAQ
- 2002: BTC Corporate Overview
- 2001: BTC Product Strategy

2001: BTC Business Sketch

Bricken Technologies Corporation – Marketing

2004: Boundary Mathematics Applications to Logic Synthesis: Empirical Results
2004: Iconic Tools Advance the State-of-the-Art
2004: Losp Synthesis System: Value Propositions
2003: Cell Libraries
2003: Circuit Design Generator Value Propositions
2002: FPGA Scaling Problems
2002: Marketing Focus
2002: Diversity and Scalability
2002: Deterministic Timing
2002: Execution Risks
2002: Problems Solved Uniquely by BTC Products
2002: ILOC Budget, Staffing, and Monthly Technical Milestones
2002: Chip Area Analysis
2002: Tool-chain Integration
2002: Seed Funding Milestones
2002: Use of Proceeds – Three Alternatives
2002: Losp Functionality
2001: Packaging Options
2001: Comparative Products
2001: Cost Effectiveness of BTC Hardware Architectures
2001: FPGA Comparative Analysis
2001: CPLD and FPGA Markets

Bricken Technologies Corporation – Products

2004: Losp Synthesis System: Comparative Capabilities
2004: Losp Synthesis System: Technical Descriptions
2004: Losp Synthesis System: Overview
2004: ILOC Delay Reduction Comparative Performance
2004: ILOC Development Project – Deliverables, Timetables, Agenda, and Milestones
2004: ILOC Development Final Report
2003: ILOC Development Overview
2003: ILOC Comparative Area Reduction
2003: ILOC Project Design Descriptions
2003: ILOC Formatting
2003: Comesh Computational Mesh Patent Draft
2003: Iconic Logic Optimizing Compiler Patent Draft
2003: Place and Route Refinements
2003: Place and Route Statistics
2003: Place and Route Examples
2003: ILOC Logic Reduction and Comesh Layout for the SP700
2003: ILOC Logic Reduction and Comesh Layout for the SP700 – Technical Supplement
2003: Comesh Comparative Benchmarks
2003: Applications for Embedded Comesh

2002: State of the ILOC Code
2002: Occlusion Array Patent Draft
2002: Schematics for the Comesh Architecture
2002: Comesh Functional Model – Illustrated Tour
2002: Comesh Cost of Silicon
2002: Comesh Specifications
2002: Comesh Encoding
2002: ILOC Implementation Validation
2001: Interface Protocols
2001: Computational Mesh

Bricken Technologies Corporation – Technical

2004: Top-down and Bottom-up Abstraction
2004: Spatial Symmetry in Logic
2004: The Advantages of Boundary Logic -- A Common Sense Approach
2004: Multiprocessing Tools
2003: Non-symbolic Proof
2003: ILOC Modular and Vector Abstraction
2003: I7 Abstraction
2003: Introduction to Boundary Logic with Sidebars
2002: Varieties of Adders
2002: From Sketch to Silicon
2002: Elusive Complexity
2002: Boundary Logic Applied to Circuitry
2002: Recursive Axiomatization of Boundary Logic
2002: CPU Architectures
2002: Conventional Interpretation of Boundary Logic Tools
2002: Occlusion Array Algebra
2002: Metalogic
2002: Nonsymbolic Logic
2002: Iconic Universe
2002: Pedagogical Coding
2002: On the Complexity of Boundary Logic
2001: Diagonalization of the Occlusion Array
2001: Using Occlusion to Evaluate Circuits
2001: CM85A: Occlusion Array
2001: CM85A: Algorithms
2001: CM85A: Metrics
2001: CM85A: Encoding
2001: CM85A: Schematics
2001: An Extended Example of Design Generation: CM85A 4-bit Magnitude Comparator
2001: Programming Heuristics in Losp
2001: Boundary Logic Languages
2001: Boundary Logic Simplified
2001: Boundary Logic Notes for Randy Katz
2001: Design of Microelectronic Integrated Circuitry

2001: The Logic Function
2001: Representations of Boundary Logic
2001: Computational Architectures
2001: Iconic Mathematics
2001: Boundary Logic Overview
2001: Boundary Numbers

Unary Computers

2001: J, the Simplest Imaginary Number
2001: Boundary Mathematics from the Beginning
2001: Axiomatization of Boundary Logic
2001: People in Boundary Math
2001: Peirce on Boundary Logic
2001: Unary Business Sketch
2000: Dense Matrix Techniques
2000: Bar Architecture
2000: Using Occlusion to Evaluate Circuits
2000: Void-based Computation
2000: Exotic Boundary Number Systems
2000: Set Aside a Space

Interval Research Corporation

2000: Integration of Losp into CAD Design
2000: Sequential Circuit Modeling and Simulation in Losp
1999: Boundary Logic Patent Draft
1999: Losp 6.5 Code Documentation
1998: A Calculus for Multilevel Combinational Circuit Minimization (book)
1998: Visualization of Circuit Minimization
1998: Losing Consciousness at Tuscon III
1998: A Question within a Question
1998: Generalized Insertion
1997: Losp 6.0 Code Documentation
1997: Bit-stream Circuit Simulation
1997: Hierarchical Modeling in Pun-Losp
1997: Symmetry in Boolean Functions
1997: Notes on Matrix Techniques for Logic
1997: Models of Circuit Properties in Losp
1997: Finite State Machines in Losp
1997: Form Abstraction in Distinction Graphs
1996: Modeling for Hardware and Software Integration
1996: Time as Depth
1996: Forms of Addition
1996: Notational Discussions
1996: Multiply Accumulators
1996: Algebra, Logic, Integers, Functions, and Sets
1996: Circuit Generators

1995: Synthesis Capabilities of Losp
1995: Losp 4.0 Usage
1995: Losp Applied to MCNC Benchmarks
1995: Possibility Waves
1995: Strategies for Combinatorial Circuit Optimization
1995: Probabilistic Timing of Combinatorial Circuits
1995: Logic Synthesis
1995: Cyclic String Notation
1995: Boolean Function Manipulation
1994: Documentation, Losp 2.0, 3.0, and 4.0
1994: Boundary Mathematics as an Integration Strategy for Computing
1994: Where Quantum Logic Differs from Classical Logic
1993: FPGAs and Boundary Logic
1993: Circuits and Boundary Logic

Oz...International, Ltd.

1994: Design of a Location-based VR Entertainment Unit
1994: Interactive Software Tools for Experiential Computing
1993: Smart Spatial Engine and Algorithms for Physical Dynamics (with J. Duluk)
1993: Declarative Logic Accelerator (with W. Kohn)
1993: Spatial Database Accelerator (with J. Duluk)
1992: Oz Business Plan: EduSpace (with M. Bricken)

Human Interface Technology Laboratory

1994: Embedding Mathematics in a Virtual World
1993: A Second Step Towards Virtual Reality: The Entity Model and System Design
1993: Experiential Computation
1992: VEOS Project Programmer's and Tool Builder's Manuals (with G. Coco)
1992: VEOS Design Goals
1991: Learning in Virtual Reality
1991: Meta Operating System and Entity Shell (with D. Pezely)
1990: Dialogue Concepts
1990: Virtual Interface Technology, Siggraph Tutorial
1990: Boundary Logic, Boundary implementations
1990: VR Directions of Growth
1990: Virtual reality is Inhabited
1990: Cognitive Models
1990: VEOS Preliminary Functional Architecture
1990: Software Architecture for Virtual Reality

Autodesk Research Laboratory

1989: The Cyberspace Project (with M. Bricken, E. Gullichsen, R. Walser, P. Gelband)
1989: Cyberspace Toolkit Software Design
1989: Geometrical and Biological Models for Space Building
1989: Fracturtles: Pictures that Compute

1988: State of the Lab
1988: Computational Drawings
1988: Mathematica Exposed
1988: Boundary Logic
1988: Boundary Thinking
1988: Autolab: Images and Ideas

Advanced Decision Systems

1988: AI Based Tools and Concepts for Cockpit Automation Technology (with S. Crawford)
1987: Distinction Networks and Neural Networks
1987: Distinction Network Parallel Processing
1987: Distinction Network Logic
1987: The Problem of Robustness: A Multi-valued Logic Approach (with P. Haddawy)
1987: Toward Real-time Inference
1987: The Efficiency of Boundary Mathematics for Deduction
1987: A Boundary Logic Tutorial with the Losp Parallel Deduction Engine (with E. Gullichsen)
1987: Boundary Numbers
1987: Utilizing Boundary Mathematics for Deduction
1987: An Intelligent Program Editor (with S. Rosenbaum)
1986: Visual Programming
1986: Machine Learning using Self-Organizing Distinction Networks
1986: A Deductive Mathematics for Efficient Reasoning
1986: Implementation of the Semantic Component of the Extended Program Model
1986: Implementation of the Extended Program Model
1986: Analysis of Errors in Mathematics
1986: Software Architecture for CASES
1986: Boolean Formal Systems
1985: An Instructable Interface
1985: Distributed Performance Maintenance for Ballistic Missile Defense
1984: A Program Reference Language
1984: Development of an Intelligent Maintenance Training Technology
1984: Intelligent Maintenance Training Systems

Stanford University

1986: The Canons of Formal Symbol Systems
1984: Laws of Form: Primary Arithmetic and Primary Algebra (qualifying exam)
1984: Curriculum Recapitulates Discovery
1984: The Procedural Curriculum
1984: A Parenthesis around Logical Foundations
1983: Logical and Cognitive Interpretations of the Laws of Form Applied to Artificial Intelligence

Atari Sunnyvale Research Laboratory

1983: Logical Proof using Losp
1983: A Model Interface Model
1983: Fractal Dimensions