

ramesh krishnamurti

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EDUCATION

Ph.D	Systems Design. University of Waterloo, Canada Dean's Scholar. University of Waterloo. 1976-78 Bursary. University of Waterloo. 1976-77 Thesis: <i>Algorithms for the construction of spatial patterns</i>	1980
M.A.Sc	Systems Design. University of Waterloo, Canada Bursary. University of Waterloo. 1974-75 Thesis: Graph Theory Algorithms	1975
B.A	Computer Science. University of Canberra, Australia Thesis: Continuous System Simulation	1974
B.E.(Honours)	Electrical Engineering. University of Madras, India EE Society Prize. College of Engineering 1969-71 Thesis: Computer-aided Circuit Analysis	1971

EXPERIENCE

Associate Dean	College of Fine Arts. Research in The Fine Arts. January 2007- Developing a new interdisciplinary PhD program in The Fine Arts Director, Studio for Creative Inquiry. May 2007-
Professor	School of Architecture. Carnegie Mellon University. Since July 1994. Chair, Graduate Program in Architecture Sciences. Aug 2000-Jul 2001. Aug 2002. Undergraduate and graduate teaching/research and doctoral student advising.
Visiting Professor	Graduate School of Computational Design, National Yunlin University of Science and Technology (NYUST), Touliu, Yunlin, Taiwan. Spring 2003+04
Assoc. Professor	Department of Architecture. Carnegie Mellon University. Sep 1989 Jun 1994. Director, CADLAB. Undergraduate and graduate teaching + research and doctoral student advising
Scientist	Artificial Intelligence group. Bolt Beranek and Newman, Systems and Technology. Edinburgh, Scotland. Apr 1988 – Jun 1989. Semantic modeling and war game simulation. DARPA funded.
Research Fellow	EdCAAD, University of Edinburgh. Scotland. Jan 1984–Mar 1988. Artificial intelligence application to design, declarative graphics programming and natural language/graphics integration
Research Fellow	Computer Science Discipline, The Open University, England. 1983. Database query language implementation. UK Engineering and Science Research Council funded.

Visiting Scholar + Research Fellow	Design Discipline. The Open University. England. Nov 1977– Dec 1982. Graph theory programming, graphics, spatial configuration algorithms and shape grammar implementation.
Teaching Assistant	Department of Systems Design. University of Waterloo, Canada. 1974–77. Differential equations, control systems, probability and statistics, network theory, programming and algorithm design (lecturer).
Tutor	Department of Mathematics. University of Canberra, Australia. 1973. Differential equations.

OTHER EXPERIENCE

Editorial Board	Building and Environment. Since 1996
Editorial Board	Languages of Design. Since 1992.
Governing Body	International Society for Mathematical and Computational Aesthetics
Journal and conference reviewer	SIGGRAPH, AIEDAM, Environment and Planning B, Research in Engineering Design, Building and Environment, Automation in Construction, Design Computing and Cognition, CAAD Futures, Mathematics and Design, Generative CAD, etc.
Project reviewer	European Strategic Programme for Information Technology. 1986–89

SERVICE

university -----

University Research Council 2006-07
University Computing Advisory Committee 2001–02
Faculty Review Committee 1997–2001
Computing Services Strategic Advisory Committee. 1998–99
Senator, Faculty Senate. 1996–97
Non-Tenured Faculty Review Board. 1991–93
Technical Computing Committee. 1991–92
Task Force on Computing in Undergraduate Education. April-May 1992
Faculty Senate Computing Committee. 1990–92

college of fine arts -----

College Review Committee. 1995-96, 2005–present
College Council. 2005-07
Operational Oversight Committee, Multimedia Studio. 1998-99

school of architecture -----

MS/Ph.D Committee. 1989–present (Acting Chair, summer 1990, Chair: 2000–01, 2002)
School Review Committee. 1994–present
Computing Committee. 1989–98, 2004-05 (Chair, 1994–95, 1996, 2004-05)
Head Search Committee, 2004

FUNDED RESEARCH

Computer-aided Design for Sustainable Building. Jan 2007- Dec 09. Autodesk. Principal Investigator. \$600,000

Predicting the interior layouts of buildings. CERL. Jan 2007-Dec 2007. Principal Investigator. \$107,000

Enhancement of the Characterization of Building Facilities. CERL. May-Sep 2006. Principal Investigator. \$14,430

Curriculum development for a new class in Advanced Visualization of Urban Systems and Infrastructures. Steinbrenner Institute for Environmental Education and Research. 2004. Principal Investigator. \$5,000

StudioX: IT Enhanced Learning Environments: Supporting Multidisciplinary Collaboration and Vertical Integration. 2002-03. Principal Investigator. \$37,000

ITR/IM+AP adsmCon: Early Detection and Management of Defects at Construction Sites Using Integrated Project Models, Laser Scanners and Embedded Sensor Systems. National Science Foundation. Grant No. CMS-0121549. Co-Principal Investigator. 2001-06. \$2,029,598 + REU support (approx \$20K/year) for 2002-04.

A Networked Environment for Education, Learning and More. Office of Technological Education, CMU. 2001-02. Principal Investigator. \$10,000

Digital Narratives. International Committee, CMU, 2001. Principal Investigator. \$10,000.

Computer Aided Facility Management. ASG Inc. Faculty Associate. 1992–93.

Rule-Based Simulation Applied to Robotized Building Construction. Japan Research Institute. Co-Principal Investigator. 1991 – 92. \$55,000.

A Specification for a Knowledge-Based Housing Design Delivery System for the Abacas Project. PATHC. Faculty Associate. 1991.

DKM Designer. Pennsylvania Advanced Technology Housing Consortium (PATHC). Faculty Associate. 1990.

ACORD: Construction and Interrogation of Knowledge Bases using Natural Language, Text and Graphics. European Strategic Programme for Information Technology: Project P393. Research Fellow. Jan.1985 – Dec.1989.

Building Description Techniques to support Computer-Aided Building Design and Production. Science and Engineering Research Council (UK) Grant No. GR/C/07568. Research Fellow. Jul. 1982 – Dec 1985.

Computational Research and Development of Shape Grammar Language. Open University. Investigator. Oct 1980 - Sep 1982

Computer Implementation and Application of Shape Grammars in Architecture. Science and Engineering Research Council (UK) Grant No. GR/A/70281. Investigator. Oct. 1978– Sep. 1980.

PUBLICATIONS AND PRESENTATIONS
exhibition -----

"Food for Thought" Participant in a living sculptural exhibit by Bascia Irland, Waterloo, Canada 1976.

book -----

1 Ö. Akin, R Krishnamurti, K-P Lam (editors) *Generative CAD Systems*, School of Architecture, Carnegie Mellon University, Pittsburgh, 2004

journal articles -----

2 Rudi Stouffs, Ramesh Krishnamurti and Kuhn Park. "Sortal Structures: Supporting Representational Flexibility for Building Domain Processes," *Computer-aided Civil and Infrastructure Engineering*, vol 22, 98-116

3 Rudi Stouffs and Ramesh Krishnamurti. "Algorithms for the classification and construction of the boundary of a shapes," *Journal of Design Research* vol 5, issue 1, 54-95, 2006. (<http://www.inderscience.com/>)

4 Ramesh Krishnamurti, "Explicit Design Spaces?" *Artificial Intelligence for Engineering Design, Analysis and Manufacturing*, 20, 95-103, 2006.

5 Ramesh Krishnamurti and Rudi Stouffs. "The boundary of a shape and its classification," *The Journal on Design Research*, vol 4, issue 1, 2004 (<http://www.inderscience.com/>).

6 R Krishnamurti and C F Earl. "Densely packed rectangulations," *Planning and Design* 25, 773-787, 1998

7 S-C Chiou and R. Krishnamurti. "Unraveling Feng-Shui," *Planning and Design*, 24(4), 549-572, 1997.

8 R. Krishnamurti and R. Stouffs. "Spatial change: Continuity, Reversibility and Emergent Shapes," *Planning and Design*, 24(3), 359-384, 1997.

9 S-C Chiou and R. Krishnamurti. "Example Taiwanese Traditional Houses," *Planning and Design*, 23, 191-216, 1996.

10 S-C Chiou and R. Krishnamurti. "The Grammatical Basis of Traditional Chinese Architecture," *Languages in Design*, 3, 5-31, 1995.

11 S-C Chiou and R. Krishnamurti. "The Grammar of Taiwanese Traditional Vernacular Dwellings," *Planning and Design*, 22, 689-720, 1995.

12 S-C Chiou and R. Krishnamurti. "The Fortunate Dimensions of Taiwanese Traditional Architecture," *Planning and Design*, 22, 547-562, 1995.

13 R. Stouffs, R. Krishnamurti and I. J. Oppenheim. "A behavioral language for motion planning in building construction," *Automation in Construction*, 3, 305-320, 1995.

14 R. Stouffs, R. Krishnamurti, S. Lee and I. J. Oppenheim. "Construction process simulation with rule-based robot planning," *Automation in Construction*, 3, 79-86, 1994. [invited article]

15 R. Krishnamurti and C.F. Earl. "Shape recognition in three dimensions," *Planning and Design*, 19, 585-603, 1992.

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- 16 R. Krishnamurti. "The arithmetic of maximal planes," *Planning and Design*, 19, 431–464, 1992.
- 17 R. Krishnamurti. "The maximal representation of a shape," *Planning and Design*, 19, 267–288, 1992.
- 18 R. Krishnamurti. "The MOLE Picture Book: on a logic for design," *Design Computing*, 1(3), 171–188, 1986.
- 19 R. Krishnamurti and C. Giraud. "Towards a shape editor: an implementation of a shape generation system," *Planning and Design*, 13, 391–404, 1986.
- 20 R. Krishnamurti. "The construction of shapes," *Planning and Design*, 8, 5–40, 1981.
- 21 R. Krishnamurti. "The arithmetic of shapes," *Planning and Design*, 7, 463–484, 1980.
- 22 R. Krishnamurti. "3-rectangulations: an algorithm to generate box packings," *Planning and Design*, 6, 331–352, 1979.
- 23 R. Krishnamurti and P. H. O'N. Roe. "On the generation and enumeration of tessellation designs," *Planning & Design*, 6, 191–260, 1979.
- 24 R. Krishnamurti and C. J. Bloch. "The counting of rectangular dissections," *Planning & Design*, 5, 1978, 207–214.
- 25 R. Krishnamurti and P. H. O'N. Roe. "Algorithmic aspects of plan generation and enumeration," *Planning & Design*, 5, 157–177, 1978.

book chapter

- 26 P. Sykes and R. Krishnamurti. "GKS Inquiry Functions within Prolog," in P.R Bono and I.Herman (eds.), *GKS Theory and Practice*, pp. 269–276, Springer-Verlag, Berlin, 1987.

conference papers

- 27 Brian Gardner and Ramesh Krishnamurti, "Ordering the Aesthetic (A+) in Architecture: Advancing a Theory of Modular Computation", Accepted for Nexus 2008, San Diego, June 2008
- 28 Kui Yue and Ramesh Krishnamurti, "Extracting Building Geometry from Range Images of Construction Sites", *CAADRIA 07*, Nanjing, China, April 18-22, 2007.
- 29 Rudi Stouffs, Ramesh Krishnamurti, Albert ter Haar, "A *sortal* building model supporting interdisciplinary design communication", *Joint International Conference on Computing and Decision Making in Civil and Building Engineering*, Montral, Canada, June 2006.
- 30 Kui Yue, Daniel Huber, Burcu Akinci, Ramesh Krishnamurti. "The ASDMCon project: The challenge of detecting defects on construction sites," Poster Paper, *Third International Symposium on 3D Data Processing, Visualization and Transmission (3DPVT'06)*, June 2006
- 31 Kuhn Park, Viraj Srivastava, and Ramesh Krishnamurti, "SmartBIM: The Progression of Integrated Building Information Model over the Life-cycle of a Building", *ACADIA2005* [Smart Architecture: Integration of Digital and Building Technologies], Savannah, Georgia, 13-16 Oct 2005
- 32 Kuhn Park, Ramesh Krishnamurti (2005) "*Diary of a Building*," Poster Exhibition, *CAADfutures2005* [Computer Aided Architecture Design Futures 2005: Learning from the past - A foundation for the future] Vienna, Austria, 20-22 June 2005
- 33 Kuhn Park, Ramesh Krishnamurti (2005) "Digital Diary of a Building," in Anand Bhatt (ed), *CAADRIA'05*, vol 2., pp. 15-25, TVB School of Habitat Studies, New Delhi, India, 28-30 April 2005.
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- 34 Yingdan Huang, Ramesh Krishnamurti and Ipek Ozkaya. "Exploring Chinese Traditional Architecture: Interactive realisation of a Traditional Constructive Process," in A Bhatt (ed), *CAADRIA'05*, vol 2., pp 102-108, TVB School of Habitat Studies, New Delhi, April 2005.
 - 35 Rudi Stouffs and Ramesh Krishnamurti. "Data views, data recognition, design queries and design rules," in JS Gero (ed.) *Design Computing and Cognition'04*, pp. 219-238, Kluwer Academic Publishers, Dordrecht, 2004.
 - 36 Ramesh Krishnamurti. 2004. "On a method of Flemming: Wall representation and orthogonal structures," in O. Akin, R. Krishnamurti, K-P Lam (eds), *Generative CAD Systems*, pp. 31-60, Pittsburgh, July 2004
 - 37 Rudi Stouffs, Ramesh Krishnamurti and Michael Cummings. 2004. "Mapping design information by manipulating representational structures." in O. Akin, R. Krishnamurti, K-P Lam (eds), *Generative CAD Systems*, pp. 387-400, Pittsburgh, July 2004.
 - 38 Kuhn Park and Ramesh Krishnamurti. "Flexible Design Representation for Construction" in Hyun Soo Lee and Jin Won Choi (eds) *CAADRIA'04*, pp. 671-680, Yonsei University Press, Seoul, Korea. 2004.
 - 39 Safwan Aly and Ramesh Krishnamurti. "Can windows and doors be design team players?" in JS Gero and FM Brazier (eds) *Agents in Design 2002*, pp 3-22, Key Centre for Design, University of Sydney, 2002.
 - 40 Rudi Stouffs and Ramesh Krishnamurti. "Representational Flexibility for Design" in J.S. Gero (ed) *Artificial Intelligence in Design'02*, pp. 105-128, Kluwer Academic, Dordrecht, The Netherlands, 2002
 - 41 Georg Suter, Ardeshir Mahdavi and Ramesh Krishnamurti. "A hierarchical representation for architectural design and decision support." *16th European Meeting on Cybernetics and Systems Research*, Vienna, Austria. April 2002
 - 42 Rudi Stouffs and Ramesh Krishnamurti. "On the road to standardization" in B. de Vries, J. van Leeuwen, H. Achten (eds) *CaadFutures'01*, pp. 75-88, Kluwer Academic, Dordrecht, The Netherlands, 2001.
 - 43 Rudi Stouffs and Ramesh Krishnamurti. "Sortal grammars as a framework for exploring grammar formalisms" in M. Burry, S. Datta, A. Dawson and J. Rollo (eds) *Mathematics and Design'01*, pp. 261-269, Deakin University, Geelong, Australia, 2001.
 - 44 Brian Gardner and Ramesh Krishnamurti "Investigating Configurations of Polyhedra in 3-Dimensional Modeling Environments" in M. Burry, S. Datta, A. Dawson and J. Rollo (eds) *Mathematics and Design'01*, pp. 174-184, Deakin University, Geelong, Australia, 2001
 - 45 Hoda Moustapha and Ramesh Krishnamurti, "Arabic Calligraphy: A Computational Exploration" in M. Burry, S. Datta, A. Dawson and J. Rollo (eds) *Mathematics and Design'01*, pp. 294-306, Deakin University, Geelong, Australia, 2001.
 - 46 Rudi Stouffs and Ramesh Krishnamurti "Standardization: a critical view" *Construction Information Technology CIB W78 International Conference*, Mpumalanga, South Africa, June 2001
 - 47 Rudi Stouffs and Ramesh Krishnamurti "Flexibility and dynamism in digital design representations" *EuroplA'8*, Delft, Netherlands, April 2001
 - 48 Rudi Stouffs and Ramesh Krishnamurti "Alternative Design Representations" *SIGraDi 2000*, Rio de Janeiro, Brazil, September 2000
 - 49 Rudi Stouffs and Ramesh Krishnamurti "Sortal grammars: a framework for exploring grammar formalisms" *QRM 2000*, Oxford, England, March 2000
 - 50 Georg Suter, Ardeshir Mahdavi, Ramesh Krishnamurti "A Performance-inspired Building Representation for Computational Design," *CAAD Futures'99*, Atlanta, 1999
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- 51 Rudi Stouffs and Ramesh Krishnamurti. "An algebraic approach to comparing representations," in J. Barallo (ed), *Mathematics & Design 98*, pp 105-114, San Sebastian, June, 1998
 - 52 Rudi Stouffs and Ramesh Krishnamurti. "Sorts: A Concept for Representational Flexibility," in R. Junge (ed), *CAAD Futures'97*, pp. 554-563, Munich, August 4-6, 1997
 - 53 Shang-Chia Chiou and Ramesh Krishnamurti. "A Grammar of Taiwanese Traditional Temples," *CAADRIA 97*, pp 297-311, Taiwan, April 17-19, 1997
 - 54 R. Stouffs, R. Krishnamurti and C. M. Eastman. "A Formal Structure for Nonequivalent Solid Representations," in S. Finger, M. Mantyla, T. Tomiyama (eds), *Proceedings of the IFIP WG 5.2 Workshop on Knowledge Intensive CAD II*, pp. 269-289, Pittsburgh, September 16-18, 1996.
 - 55 R. Stouffs and R. Krishnamurti. "On a query language for weighted geometries," in O. Moselhi, C. Bedard, S. Alkass (eds), *Third Canadian Conference on Computing in Civil and Building Engineering*, pp. 783-793, Canadian Society of Civil Engineers, Montreal, Canada. August 26-28 1996.
 - 56 Rudi Stouffs and Ramesh Krishnamurti. "The extensibility and applicability of geometric representations," *3rd Design and Decision Support Systems in Architecture and Urban Planning Conference, Architecture Proceedings*, pp. 436-452. Eindhoven University of Technology, Eindhoven, The Netherlands, August 18-21 1996.
 - 57 Rudi Stouffs and Ramesh Krishnamurti. "An Algebraic Approach to Shape Computation (Position Paper)," *Workshop on Reasoning with Shapes in Design, Artificial Intelligence in Design'94*, pp. 50-55, Lausanne, Switzerland, August 15-18 1994
 - 58 R. Stouffs, S. Lee, R. Krishnamurti and I. J. Oppenheim. "Representing robots for building construction simulation," in A. Delsante, J Mitchell, and R. van der Perre (eds), *Building Simulation'93*, pp. 533-339, International Building Performance Simulation Association (IBPSA). Ghent, Belgium, 1993. [Proceedings of the Building Simulation'93 conference, Adelaide, Australia, August 16-18]
 - 59 R. Krishnamurti and R. Stouffs. "Spatial Grammars: Motivation, Comparison and New Results," in U. Flemming and S. Van Wyk.(eds.) *CAAD Futures'93*, pp. 57-74, Elsevier Science Publishers B.V., Netherlands, 1993. [Proceedings of the CAAD Futures'93 conference, Pittsburgh, PA, U.S.A., July 7-10]
 - 60 R. Stouffs and R. Krishnamurti. "The complexity of the maximal representation of shapes," *Proceedings of the IFIP Workshop on Formal Methods for Computer-Aided Design*, pp. 53-66, Talinin, Estonia, June 16-19 1993.
 - 61 R. Stouffs, R. Krishnamurti, S. Lee and I. J. Oppenheim. "Construction process simulation with rule-based robot planning," in G Watson, R Tucker, J Walters (ed.), *Automation and Robotics in Construction X*, pp. 495-502, Elsevier Science, Amsterdam, 1993. [Proceedings of the Tenth International Symposium on Automation and Robotics in Construction (ISARC/93) Houston, TX, U.S.A., May 24-26]
 - 62 R. Krishnamurti. "Modelling Design Descriptions," in *Proc. International Joint Conference on CAD and Robotics in Architecture and Construction*, pp. 131-143, Marseilles, June 1986.
 - 63 P. Sykes and R. Krishnamurti. "GKS Inquiry Functions in Prolog," in C E Vandoni (ed.) *Eurographics'85*, pp. 185-191, North-Holland, Amsterdam, 1985 [Proceedings of the *Eurographics'85* conference, Nice, France, September 1985]
 - 64 R. Krishnamurti and P. Sykes. "A Graphical Interface to Prolog," Presented at *ESPRIT'85*, Brussels, August 1985.
 - 65 C. F. Earl and R. Krishnamurti. "Spatial relations, kinematics and assembly," in *Proc. International Symposium on Design and Synthesis*, pp. 589-593, Japan Society of Precision Engineering, Tokyo, July 1984.
-

- 66 Peter Gaal and Ramesh Krishnamurti. "CINDY: A programme for continuous system simulation," in *Procs. Conf. on Computing in the CAE*, Australian Commission on Advanced Education, Canberra, April 1974.

technical reports _____

- 67 R. Krishnamurti. Representational semantics for graphical dialogue. EdCAAD, University of Edinburgh, January 1988. ESPRIT Project (ACORD) deliverable report.
- 68 R. Krishnamurti. Issues in shape editing and shape representation. EdCAAD, University of Edinburgh, July 1987. ESPRIT Project (ACORD) deliverable report.
- 69 R. Krishnamurti. The Prolog/GKS Reference Manual 2 vols. EdCAAD, University of Edinburgh, May 1987. ESPRIT Project (ACORD) deliverable report.
- 70 R. Krishnamurti, R. Kemp and P.Sykes. The Prolog/GKS Binding. EdCAAD, University of Edinburgh, May 1987. ESPRIT Project (ACORD) deliverable report.
- 71 R. Krishnamurti and R. Kemp. An overview of C-Prolog/GKS. EdCAAD, University of Edinburgh, April 1987. ESPRIT Project (ACORD) deliverable report.
- 72 R. Krishnamurti and R. Kemp. Implementation of GKS/Prolog. EdCAAD, University of Edinburgh, December 1986. ESPRIT Project (ACORD) deliverable report.

unpublished public presentations (since 1993) _____

- 73 Implementing shape grammars, June 2007, Chinese University of Hong Kong.
- 74 The art of the grammarist, April and June 2007. Presented at:
- Tongji University, Shanghai, China
 - Southern Taiwan University, Tainan, Taiwan
 - Providence University, Taichung, Taiwan
 - National Cheng-Kong University, Tainan, Taiwan
- 75 Building Characterization Workshop, University of Illinois, Champaign-Urbana. May 2006. A series of 4 seminars on:
- The Building Sensory Project; b) An overview of shape grammars; c) Grammar implementation; and d) Grammar-based recognition: goals, issues, approaches and experience
- 76 Sortal descriptions and spatial constructions, June 2003. Presented at:
- National Chiao-Tung University, Hsin-chu, Taiwan
 - National Taiwan University of Science and Technology, Taipei, Taiwan
- 77 Sortal descriptions, March 2003. Presented at:
- National Cheng-Kong University, Tainan, Taiwan
 - National Yunlin Univeristy for Science and Technology (NYUST) Touliu, Taiwan
- 78 Sorts and Configurational Design. University of Sydney, Australia, June 2001.
- 79 Implementation of Shape Grammars. MIT, April 1999.
- 80 Has technology really helped architectural design? ETH, Zurich. March 1998
- 81 Southern Style Chinese Vernacular Architecture. CMU. September 1997
- 82 Implementation of Shape Grammars. MIT. April 1997.
- 83 Inquiry into Shapes, MIT. September 1993
-

DOCTORAL STUDENTS

principal advisor

Casey Hickerson

[coursework] in interaction design, diagramming and visual languages. Architecture.

Yuchang Hu

[coursework] in novel human-computer interaction and environmental assessment. Architecture.

Tsung-hsien Wang

[coursework] in parametric modeling for sustainable buildings. Architecture.

Tajin Biswas

[coursework] in computer-aided design for sustainable building. Architecture

Maffee Peng-hui Wan

[candidacy] on wayfinding and reactive environments. Architecture.

Kui Yu

[candidacy] Thesis Topic: Shape grammar approach to the prediction of the interiors of buildings from range images of their exterior. Architecture.

Kuhn Park

School of Architecture, Texas Tech, Lubbock, TX

[candidacy][in-absentia] Thesis Topic: Sortal structures for Building Design and Construction. Architecture.

Brian Gardner

US Airways (retired), Las Vegas

[candidacy] [in-absentia] Thesis Topic: The Aesthetics Dimension in Architecture. Architecture.

Ashwini Dongre née Bhide

New Jersey

[candidacy][in-absentia] Thesis Topic: Sketch-based environment for direct manipulation of constraints in building layouts. Architecture.

Luis Rico-Gutierrez

College of Fine Arts

[candidacy] Thesis: Pointing to the Past while Talking about the Future: Building Common Ground in Urban Design through Computer Filtering of Precedents. Architecture.

Safway Aly

ADEA Solutions, INC.

A Framework for Interaction and Task Decomposition for Objects Emulating Agency Behavior. Architecture. May 2000.

Shang-Chia Chiou

Graduate School of Computational Design, NYUST, Douliu, Taiwan.

Computational Considerations of Historical Architectural Analysis: A Case Study of Chinese Traditional Architecture. Architecture. September 1996.

Rudi Stouffs

Department of Building Technology, Technical University of Delft, Netherlands

The Algebra of Shapes. Architecture. April 1994

Sergio Sedas Gersey
Philips Lighting, Monterrey, Mexico
Algorithms for Automatic Sensor Placement to Acquire Complete and Accurate Information. Robotics and Architecture. May 1993.

thesis committee -----

Sanghoon Lee
[candidacy] Thesis: Computational Fieldwork Support for Efficient Maintenance of Building Utilities. Architecture.

Hoda Moustapha
Architectural Explorations: A Formal Representation for the Generation and Transformation of Design Geometry. Architecture. September 2005.

Georg Suter
Department of Building Physics and Human Ecology, Vienna University of Technology, Austria. *A Representation for Design Manipulation and Performance Analysis*. Architecture. December 1999

Chris Carlson
Wolfram Research, Chicago.
Grammatical Programming: An Algebraic Approach to the Description of Design Spaces. Architecture. February 1993.

Jeff Heisserman
Boeing Corporation, Seattle.
Generative Geometric Design and Boundary Solid Grammars. Architecture. May 1991.

external reader -----

Seth Orsborn
[dissertation] Quantifying aesthetic preference through statistics applied to an agent-based shape grammar implementation. Mechanical Engineering.

Bigge Tuncer
Faculty of Architecture, Technical University of Delft, The Netherlands
[dissertation] A Flexible and Extensible Framework for Knowledge Representation in Architecture. Building Technology, Technical University of Delft, The Netherlands.

Kuo, Jen-hui
A Dual Constructive Framework (D-Con) In Conceptual Layout Design
Graduate Institute of Architecture, National Chiao Tung University, Taiwan. August 2003

Linda Schmidt
Department of Mechanical Engineering, University of Maryland
An implementation using Grammars of an Abstraction-based Model of Mechanical Design for Design Optimization and Design Space Characterization. Mechanical Engineering. May 1995.

Steven Meyer
A Description of the Structural Design of Tall Buildings through the Grammar Paradigm. Civil Engineering. May 1995.

Sudheer Apte
A Representation for Spatial Constraints in Material Removal. Civil Engineering. July 1992.

Jose Alsino
An Expert System for Aircraft Design. Aeronautical Engineering, Cranfield Institute of Technology, England. April 1988.

MASTER STUDENTS

- 1991 Churn-der Hwang
Wen-yang Lin
Mark Schindewolf
Rudi Stouffs
- 1992 Dajun Lin
Robert Ching-ping Tseng
- 1993 Zeyno Aygen
Shang-chia Chiou
James Shaw
- 1994 Teng-wen Chang
Hsiang-lin Huang
Parag Parekh
Jonah Wen-jaw Tsai
- 1995 Roland de Filippi
- 1996 Bige Tuncer
- 1999 James Kuo
Rene Galindo-Legaria
Brian Proffitt
Frank Li-jang Wang
- 2002 Alex Vangaalen
Hanjin Kim
- 2003 Sung ho Hong
Sangwon Lee
-

TEACHING

- 48-789 cad project iv: shape and computation** [required]
- Spring 2007 This course continues the project requirements aspects of 48-788 CAD Project III into a completed documented project. Lectures and readings will be based on two sources of materials. The first will be on the subject matter of the courses, namely, on seminal articles on shape and spatial computation and on readings related to the individual student projects. Students will be expected to 'lead' the discussion during lectures relating to their individual projects. Students are assessed on a completed project, in-class presentation of their work as well as a properly documented technical report of their work.
- 48-747 shape grammars** [selective]
- Fall 2007 Introduces spatial grammars and their application to design and composition. Shape grammars have been used extensively to understand styles of architecture, landscape design, fine art and ornament, and more recently applied to civil and mechanical engineering design. Topics include the formal and informal aspects of grammars, evolution of grammatical ideas, their relevance, application and use in the analyses of 'styles' syntheses of 'form' and the incorporation of 'function', transformations of grammars, and the implementation of grammars. Expanded version formed the shape and computation course offered in 2000.
- Spring 1989-2006
- 48-770 computer programming and data structures** [required]
- Fall 2007 A gentle but dense introduction to computer programming in Java for students with no prior programming experience. The course places an emphasis on program structures, data structures data abstraction and dynamic data (including linked lists, queues and stacks), sort and search algorithms, gui design and design patterns.
- Spring, Fall 2006
- 48-746 graphical user interface design** [elective]
- Fall 2006 The course explores issues relating to the design of graphics user interface, which can be critical to the success or failure of a computer system. A well-designed GUI can free the user from learning complex command languages and allow interactions with the computer system much more effectively. Traditionally building a GUI has not been an easy task for non-professionals. The topics covered include, but not limited to, generating graphics, event handling, user interface components, selected user interface design patterns, and visual interface evaluation. The course is project based: students are expected to complete a working visually appealing interface.
- 48-570 digital media elective** [elective]
- Fall 2006 The focus of this course is on novel and significant ways of presenting architectural ideas through the use of digital media. The goal of the course is to take students beyond conventional digital design and modeling approaches through a variety of techniques and methodologies, e.g., story boarding, generative design, parametric design etc. This is a project course. Through their own project, students will push the use of digital technology as far as they can whether this is in design, animation, presentation or fabrication. The course is based on Rhino, Maya, 3DSMax, Premier and AfterEffects and other appropriate software.
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	48-760 advanced computer modeling	[elective]
	48-560 computer modeling III	
Fall 1995–2005	This course explores the role and significance of visualization the design process, in doing so, project from the current state-of-the-art to glimpses of the future. Advanced digital technology in multimedia and virtual reality, through state-of-art modelling, animation, compositing and video editing software – have provided the impetus to radically improve the human designer’s ability to see and understand physical reality. A range of technical visualization skills together with the conceptual basis, make these capabilities meaningful and useful.	
	48-749 special topics in computational design: spatial constructions	[selective]
Spring 2005	Explores spatial constructions from both a theoretical and a practical standpoint. Course briefly introduces a variety of construction paradigms that are related to spatial or geometric forms, with a slant towards design or composition. The emphasis is on the ‘mechanical’ aspects of spatial constructions. Topics include Euclidean construction based on ruler + compass, which leads onto areas such as "computational origami", Cartesian construction based on grids and equations, Mongean construction based on orthographic and perspective projections, Kleinian construction based on symmetry and geometric transformations, Archimedean constructions based on tiled designs on regular, semi-regular and demi-regular tessellations, Boolean constructions based on spatial arithmetic, Rule based construction based on spatial grammars etc. The goal of the course is to open up new areas or problems to explore and research.	
Fall 2003		
	48-745 geometrical modeling	[selective]
Spring 1996–98, 2002, 2004	Introduces models and algorithms needed to represent and solve geometrical problems. Course is in two parts, one dealing with solid models, the other with surface models or computational geometry. Course emphasizes the general applicability of such models and algorithms through mathematical and computational strategies to represent geometric objects in order to solve problems that are, inherently geometrical, and are adequate to answering arbitrary geometric questions.	
	48-711 paradigms and methods of research in architecture	[required]
Fall 2004	An introduction to important models and methods of academic research, as these relate to building design and sciences. These models include those of natural science, social science, sciences of the artificial, engineering, quantitative and qualitative statistics, databases, aesthetics and ethics.	
	62-585 designing alternative exhibition environments for digital media	[elective]
Spring 2002	With Tim Hadfield and Marsha Berger Concerned with exploring strategies for the presentation of digital media at specific non-traditional sites.	
	48-560 digital narratives	[elective]
Fall 2001	With Bharat Dave, University of Melbourne and Luis Rico-Gutierrez. A joint international, collaborative, undergraduate course on exploring the role of digital media and visualization – interactive and multimedia modeling – in the context of design between the School of Architecture, Carnegie Mellon University and the Faculty of Architecture, Building and Planning, University of Melbourne.	

	48-757 patterns, symmetry and configurations	[selective]
Spring 2000-01	Concerned with the geometrical and aesthetic nature of design and culture. Representational and algorithmic issues concerned with compositions of spatial forms are examined, specifically, constructive characterizations of spatial designs and configurations exploring frameworks with given geometrical, topological, and symmetry properties, and defined by given relations, parameters or motifs. Exemplars include a range of designs – artificial and natural – from a variety of cultures, and published techniques for dealing with such designs.	
	48-120 computer modeling I	[required]
Fall 1996–2002	Freshman seminar on computer applications to architecture. Course covered software for 3D modeling, photo/image manipulation, page layout and web page production.	
	48-120 fundamentals of architectural geometry	[required]
Fall 1990-95	With Ulrich Flemming Dealt with geometric figures, transformational geometry, proportional systems, symmetry and wall paper designs, generative and descriptive geometry, shading and shadowing of geometrical figures.	
	48-746 design interfaces	[required / selective]
Spring 1989-93, 1995, 1998-99	Explored models of computer usage and users, principles and methodology of interface design, interaction styles and techniques, story boards, programming techniques and tool-kits, examples of interfaces, help and graphical presentation.	
	48-790 graduate seminar	[required]
Fall 1994-98	Preparatory seminar course for graduate research.	
	48-740 architectural computing tool	[required]
Fall 1995	Introduced computers for software development for architectural applications.	
	48-750 programming in C	[required]
Fall 1992–94	C programming with an emphasis on program structures, data structures (including arrays, structs, unions and enumerated types), data abstraction and dynamic data (including linked lists, queues and stacks).	

A BRIEF AUTOBIOGRAPHICAL SKETCH

I am a Professor in the graduate program within the School of Architecture at Carnegie Mellon University.

My principal area of research is in computational design with particular emphasis on the formal, semantic and algorithmic aspects of generative construction and the development of design as computation via highly coupled parallel explorations of form and description. I am perhaps, best known, for my work on the computational problems in shape grammar theory and for algorithms for spatial patterns.

I read Electrical Engineering at the University of Madras, India graduating with honors, and Computer Science at the University of Canberra, Australia. I entered the graduate program in Systems Design at the University of Waterloo, Canada earning a M.A.Sc in 1975 and Ph.D in 1980.

In 1978, while still a doctoral student at Waterloo, at the invitation of Professor Lionel March, I went to the Centre for Configurational Studies, Open University, England, where I worked on spatial configuration problems, graph theory programming, graphics programming and shape grammar implementation. In 1983, I worked in the Computer Science discipline on implementing the BCS recommended database query language. In 1984, I went to University of Edinburgh's EdCAAD group headed by Aart Bijl to work on applications of artificial intelligence to architectural design and declarative graphics languages. During that time I worked closely with the AI group and the Cognitive Science on the ESPRIT (European Strategic Programme on Information Technology) project dealing with the integration of graphics and natural language.

In 1988 I briefly left academe to work at Bolt, Beranek and Newman. I was involved in two major projects one on a semantic modeling system built on top of BBN's KRNL system. The other project was SIMNET a war game simulation project in which I was responsible for writing the radio communication code. Both projects were funded by DARPA. During that year I was also a project reviewer for ESPRIT.

In September 1989 I was invited to join the faculty of the School of Architecture at Carnegie Mellon University. I was tenured and became a full professor in 1994. My responsibilities include both undergraduate and graduate teaching and Ph.D. advising. In 2000-01 and 2002-03 I served as the Chair of the Department's graduate program.

I have spent over a quarter of a century in schools of Fine Arts and Design. Much of my work has a multi-disciplinary flavor. I have worked on object-agents in design environments, knowledge-based design systems, the integration of natural language and graphics, spatial algorithms, robotic construction, computer simulation, computer graphics and graphical programming environments, user-interfaces for a variety of design applications and computer supported collaborative work. I recently completed a National Science Foundation funded project, working with researchers from Civil Engineering and Robotics, that looked at the utilization of laser scanning and embedded sensor technologies within a dynamically changing construction environment, and in "interpreting" the 3D as-built environment model generated through scanners and embedded sensor systems, and "assessing" the implications of what is interpreted; and with researchers from Delft University, looking at generative design and model representations, and motivated by the fact that different groups of people and applications have different views of the same informational structure.

I am took some of the ideas and methods developed in this project into two vastly different funded projects, the first on grammar-based prediction of interiors of buildings from range images, in conjunction with researchers at the University of Illinois and CERL, the second in applying computer-aided techniques to support sustainable design in collaboration with Autodesk, a CAD software company. Both projects are completing their first year with continued funding.

I teach and have taught courses in shape grammars, spatial constructions, geometrical modeling, computer animation, and have taught courses in configurational design, symmetry, geometry, computer modeling, computer programming, and interface design.

In January 2007, I was appointed as Associate Dean of Research in the College of Fine Arts with the remit to create a new interdisciplinary PhD program in The Arts. In May 2007, I was asked to become the Director, Studio for Creative Inquiry, whose mission is to support creation and exploration in the arts, especially interdisciplinary projects that bring together the arts, sciences, technology, and the humanities, and impact local and global communities.
