Curriculum Vitæ

Dinesh K. Pai

Office address:
Dept. of Computer Science
2366 Main Mall, UBC
Vancouver, B.C. V6T 1Z4, Canada

Phone: (604) 822-8197
FAX: (604) 822-0848
Email: pai@cs.ubc.ca
URL: www.cs.ubc.ca/∼pai

Fields of Interest: Sensorimotor Computation, Graphics, Robotics, Haptic and Auditory Interfaces, Physical Modeling, Interactive Simulation.

Education:

May '88	Cornell University, Ithaca, NY. Doctor of Philosophy, Mechanical Engineering. Minors: Computer Science and Mathematics. Thesis: Singularity, Uncertainty and Compliance of Robot Manipulators.
Jan. '86	Cornell University, Ithaca, NY. Master of Science. Thesis: An Environment for Computer Graphic Simulation of Robotic Applications.
Aug. '82	Indian Institute of Technology, Madras, India. Bachelor of Technology, with distinction.

Professional Experience:

8/91–	Professor, July 01-, Associate Professor, '96-01, Assistant Professor '91-'96. Dept. of Computer Science, Univ. of British Columbia, Vancouver, Canada.
9/02–	Professor, Dept. of Computer Science, Rutgers University, Piscataway, NJ.
1/98–8/98	Visiting Professor, Robotics Institute, Carnegie-Mellon Univ., Pittsburgh, PA.
6/88–8/91	Post-Doctoral Associate, Computer Science, Cornell University, Ithaca, NY.
1/88–5/88	Instructor, Mechanical Engineering, Cornell University, Ithaca, NY.
9/82–12/87	Research and Teaching Assistant, Cornell University, Ithaca, NY.
12/81–1/82	Engineer Trainee, Indian Space Research Organization, Ahmedabad, India.

Honors and Awards:

'06	Canada Research Chair in Sensorimotor Computation (Tier 1).
'94	Fellow of the BC Advanced Systems Institute.
'81–'82	National Merit Scholarship, Government of India,
'75	National Merit Prize, Government of India.

Publications

Currently 107 peer reviewed papers, including 8 SIGGRAPH papers.

Refereed Journals

1. O. G. Cula, K. J. Dana, D. K. Pai, D. Wang "Polarization Multiplexing and Demultiplexing for Appearance-based Modeling" in *IEEE Transactions Transactions on Pattern Analysis and Machine Intelligence*, Vol. 29, No. 2, February 2007. pp. 362–367.

2. R. Hoskinson and D. K. Pai, "Synthetic Soundscapes with Natural Grains," in *Presence: Teleoperators and Virtual Environments*, The MIT Press. Vol. 16, No. 1, February 2007. pp. 84–99.

3. P. G. Kry, and D. K. Pai, "Interaction Capture and Synthesis," in *ACM Transactions on Graphics (Proc. SIGGRAPH)*, 25(3), July 2006. pp. 872–880.

4. D. L. James, J. Barbic, and D. K. Pai, "Precomputed Acoustic Transfer: Output-sensitive, accurate sound generation for geometrically complex vibration sources," in *ACM Transactions on Graphics (Proc. SIGGRAPH)*, 25(3), July 2006. pp. 987–995.

5. D. M. Kaufman, T. Edmunds, and D. K. Pai, "Fast Frictional Dynamics for Rigid Bodies," in *ACM Transactions on Graphics (Proc. SIGGRAPH)*, 24(3), July 2005. pp. 946-956.

6. N. Krislock, J. Lang, J. Varah, D. K. Pai, and H-P. Seidel, "Local Compliance Estimation via Positive Semi-Definite Constrained Least Squares," in *IEEE Transactions on Robotics and Automation*, Vol. 20, No. 6, December 2004. pp. 1007-1011.

7. W.Y. Zhang, R.N. Rohling, and D.K. Pai, "Surface extraction with a three dimensional freehand ultrasound system," in *Ultrasound in Medicine & Biology*, Vol. 30, No. 11, November 2004. pp. 1461–1473.

8. D. L. James and D. K. Pai, "BD-Tree: Output-Sensitive Collision Detection for Reduced Deformable Models," in *ACM Transactions on Graphics (Proc. SIGGRAPH)*, 23 (3), August 2004. pp. 393–398.

9. K. van den Doel, D. Knott, and D. K. Pai, "Interactive Simulation of Complex Audio-Visual Scenes," in *Presence: Teleoperators and Virtual Environments*, The MIT Press, 13:1, February 2004. pp. 99–111.

10. D. James and D. K. Pai, "Multiresolution Green's Function Methods for Interactive Simulation of Large-scale Elastostatic Objects." in *ACM Transactions on Graphics*, 22:1, January 2003. pp. 47–82.

11. P. G. Kry and D. K. Pai, "Continuous Contact Simulation for Smooth Surfaces." in *ACM Transactions on Graphics*, 22:1, January 2003. pp. 106-129.

12. P. K. Agarwal, et al. "Algorithmic issues in modeling motion", in *ACM Computing Surveys*, 34:4, December 2002, pp. 550–572.

13. J. Lang, D. K. Pai and R. J. Woodham, "Acquisition of Elastic Models for Interactive Simulation," in *International Journal of Robotics Research*, 21:8, June 2002. pp. 713-733.

14. D. K. Pai "STRANDS: Interactive Simulation of Thin Solids using Cosserat Models," in *Computer Graphics Forum*, The International Journal of the Eurographics Association, Volume 21 (2002), Number 3. pp. 347–352.

15. D. L. James and D. K. Pai, "DyRT: Dynamic Response Textures for Real Time Deformation Simulation with Graphics Hardware," *ACM Transactions on Graphics (Proc. SIGGRAPH)*, 21 (3), July 2002. pp. 582-585.

16. L. M. Reissell and D. K. Pai "Modeling Stochastic Dynamical Systems for Interactive Simulation," in *Computer Graphics Forum*, The International Journal of the Eurographics Association, 20:3, September 2001, pp. 339-348.

17. D. James and D. K. Pai, "A Unified Treatment of Elastostatic Contact Simulation for Real Time Haptics," *Haptics-e*, the Electronic Journal of Haptics Research. Vol.2, No. 1, September 2001. `http://www.haptics-e.org`. 13 pages.

18. R. L. Klatzky, D. K. Pai, and E. P. Krotkov, "Perception of Material from Contact Sounds," *Presence: Teleoperators and Virtual Environments*, 9:4, August 2000, The MIT Press. pp. 399-410.

19. R. J. Spiteri, D. K. Pai, and U. M. Ascher, "Programming and Control of Robots by means of Differential Algebraic Inequalities." *IEEE Transactions on Robotics and Automation*, 16:2, April 2000, pp. 135–145.

20. J. E. Lloyd, J. S. Beis, D. K. Pai, and D. G. Lowe, "Programming Contact Tasks Using a Reality-based Virtual Environment Integrated with Vision." *IEEE Transactions on Robotics and Automation,* 15:3, June 1999, pp. 423–434.

21. K. van den Doel and D. K. Pai, "The Sounds of Physical Shapes," *Presence: Teleoperators and Virtual Environments*, 7:4, The MIT Press, 1998. pp. 382–395.

22. D. K. Pai and L.-M. Reissell, "Multiresolution Rough Terrain Motion Planning," *IEEE Transactions on Robotics and Automation*, 14 (1), February 1998, pp. 19–33.

23. U. M. Ascher, D. K. Pai and B. Cloutier, "Forward Dynamics, Elimination Methods, and Formulation Stiffness in Robot Simulation," *International Journal of Robotics Research*, 16:6, December 97, pp. 749–758.

24. D. K. Pai and L.-M. Reissell, "Haptic Interaction with Multiresolution Image Curves," *Computers and Graphics*, Vol. 21, No. 4, July/August 1997, pp. 405-411.

25. K. van den Doel and D. K. Pai, "Performance Measures for Constrained Systems," *IEEE Transactions on Robotics and Automation*, 13:2, April 1997, pp. 278–289.

26. K. van den Doel and D. K. Pai, "Performance Measures for Locomotion Robots," *Journal of Robotic Systems*, 14:2, February 1997, pp. 135–147.

27. K. van den Doel and D. K. Pai, "Performance Measures for Robot Manipulators: A Unified Approach," *International Journal of Robotics Research*, 15:1, February 1996, pp. 92–111.

28. D. K. Pai, R. Barman, and S. Ralph, "Platonic Beasts: Spherically Symmetric Multilimbed Robots," *Autonomous Robots*, 2:4, December 1995, pp. 191–201.

29. B. R. Donald and D. K. Pai, "The Motion of Compliantly-Connected Rigid Bodies in Contact," *International Journal of Robotics Research*, 12:4, August 1993, pp. 307–337.

30. D. K. Pai and M. C. Leu, "Genericity and Singularities of Robot Manipulators," *IEEE Transactions on Robotics and Automation*, 8:5, October 1992, pp. 545–559.

31. D. K. Pai and M. C. Leu, "Uncertainty and Compliance of Robot Manipulators with Applications to Task Feasibility," *International Journal of Robotics Research*, 10:3, June 1991, pp. 200–213.

32. D. K. Pai and V. R. Raghavan, " A Thermal Conductivity Model for Two-phase Media," *Letters in Heat and Mass Transfer*, Pergamon Press, 1982, 9:21–27.

SIGGRAPH Conference Proceedings (refereed, highly selective)

Prior to 2002. Since then, SIGGRAPH papers are simultaneously published in the ACM Transactions on Graphics; see Journal section.

33. D. K. Pai, K. van den Doel, D. L. James, J. Lang, J. E. Lloyd, J. L. Richmond, S. H. Yau, "Scanning Physical Interaction Behavior of 3D Objects," in *Computer Graphics (ACM SIGGRAPH 2001 Conference Proceedings)*, August 2001, pp. 87–96.

34. K. van den Doel, P. G. Kry and D. K. Pai, "FoleyAutomatic: Physically-based Sound Effects for Interactive Simulation and Animation," in *Computer Graphics (ACM SIGGRAPH 2001 Conference Proceedings)*, August 2001, pp. 537–544.

35. D. L. James and D. K. Pai, "ArtDefo, Accurate Real Time Deformable Objects," in *Computer Graphics (ACM SIGGRAPH 99 Conference Proceedings)*, pp. 65–72, August 1999.

Refereed Conference Proceedings

36. L. M. Reissell and D. K. Pai, "High-Resolution Analysis and Resynthesis of Environmental Impact Sounds," to appear in *Proceedings of the International Conference on Auditory Display*, Montreal, PQ, June 26-29, 2007.

37. L. M. Reissell and D. K. Pai, "High Resolution Analysis of Impact Sounds and Forces," in Proceedings of WorldHaptics (Joint Eurohaptics Conference and IEEE Symposium on Haptic Interfaces for Virtual Environment and Teleoperator Systems), Tsukuba, Japan, March 22-24, 2007. pp. 255-260.

38. T. Edmunds and D. K. Pai, "An Event Architecture for Distributed Interactive Multisensory Rendering," 5th IEEE and ACM International Symposium on Mixed and Augmented Reality, Santa Barbara, CA, October 22-25, 2006. pp. 197-202.

39. P. G. Kry and D. K. Pai, "Grasp Recognition and Manipulation with the Tango," International Symposium on Experimental Robotics, Rio de Janeiro, Brazil, July 6-10, 2006. 9 pages.

40. E. Ruffaldi, D. Morris, T. Edmunds, F. Barbagli, D. K. Pai, "Standardized Evaluation of Haptic Rendering Systems" in proceedings of the 14th Symposium on Haptic Interfaces for Virtual Environment and Teleoperator Systems, Washington, DC, March 25-26, 2006.

41. K. Yin, D. K. Pai, and M. van de Panne, "Data-driven Interactive Balancing Behaviors," Pacific Graphics, Macao, China, October 12-14, 2005. 9 pages.

42. O. G. Cula, K. J. Dana, D. K. Pai, D. Wang "Polarization Multiplexing for Bidirectional Imaging," in Proceedings of the IEEE International Conference on Computer Vision and Pattern Recognition (CVPR 2005), San Diego, June 20-26, 2005. pp. 1116-1123.

43. D. K. Pai, E. W. VanDerLoo, S. Sadhukhan, P. G. Kry "The Tango: a tangible tangoreceptive whole-hand human interface," in Proceedings of WorldHaptics (Joint Eurohaptics Conference and IEEE Symposium on Haptic Interfaces for Virtual Environment and Teleoperator Systems), Pisa, Italy March 18-20, 2005. pp. 141–147.

44. D. Kaufman and D. K. Pai, "Rapid Collision Dynamics of Multiple Contacts with Friction," in Multi-point Interaction with Real and Virtual Objects, F. Barbagli et al. (Eds.), Springer Tracts on Advanced Robotics 18, 2005. pp. 3–19.

45. M. Pauly, D. K. Pai, and L. Guibas, "Quasi-Rigid Objects in Contact," Proceedings of ACM SIGGRAPH/Eurographics Symposium on Computer Animation 2004, Aug 2004, pp. 109–119.

46. D. K. Pai, "Multisensory Interaction: Real and Virtual," in proceedings of the International Symposium on Robotics Research, Siena, Italy, October 19-22, 2003 (Invited Paper). Also appears in *Robotics Research: the Eleventh International Symposium*, P. Dario and R. Chatila (Eds.), Springer Tracts on Advanced Robotics 15, 2005. pp. 489-498.

47. K. Yin, M. B. Cline, D. K. Pai, "Motion Perturbation Based on Simple Neuromotor Control Models." Pacific Conference on Computer Graphics and Applications 2003, pp. 445–449.

48. K. Yin and D. K. Pai, "FootSee: an Interactive Animation System," in Proceedings of the Eurographics/SIGGRAPH Symposium on Computer Animation, San Diego, July 26-27, 2003, pp. 329–338.

49. J. Lang, D. K. Pai and H-P. Seidel, "Scanning Large-Scale Articulated Deformations," in Proceedings of *Graphics Interface*, Halifax, June 2003. pp. 265–272.

50. D. Knott and D. K. Pai, "CInDeR: Collision and Interference Detection in Real-time using Graphics Hardware," in Proceedings of *Graphics Interface*, Halifax, June 2003. pp. 73–80.

51. M. B. Cline and D. K. Pai, "Post-Stabilization for Rigid Body Simulation with Contact and Constraints", in Proceedings of the IEEE *International Conference on Robotics and Automation*, March 2003. pp. 3744–3751.

52. D. K. Pai and P. Rizun, "The WHaT: a Wireless Haptic Texture Sensor," in proceedings of the Eleventh Symposium on Haptic Interfaces for Virtual Environment and Teleoperator Systems, Los Angeles, March 22-23, 2003. pp. 3–9.

53. Y. Zhang, R. Rohling, and D. K. Pai, "Direct Surface Extraction from 3D Freehand Ultrasound Images," in IEEE Visualization 2002, Boston, October 27-November 1, 2002. pp. 45–52.

54. P. G. Kry, D. L. James, and D. K. Pai, "EigenSkin: Real Time Large Deformation Character Skinning in Hardware," in Proceedings of the ACM SIGGRAPH Symposium on Computer Animation, San Antonio, July 21-22, 2002. pp. 153–159.

55. J. E. Lloyd and D. K. Pai, "Interactive Exploration of Remote Objects Using a Haptic-VR Interface," in Experimental Robotics VIII (proceedings of the International Symposium on Experimental Robotics, Italy, July 8-11, 2002), B. Siciliano and P. Dario (Eds.), Springer Tracts on Advanced Robotics, Vol. 5, 2003. pp. 560 – 569.

56. K. van den Doel, D. K. Pai, T. Adam, L. Kortchmar, and K. Pichora-Fuller, "Measurements of Perceptional Quality of Contact Sound Models," in Proceedings of the International Conference on Auditory Display, Kyoto, July 2-5, 2002.

57. J. Lang, D. K. Pai, and R. J. Woodham, "Robotic Acquisition of Deformable Models," in Proceedings of the IEEE *International Conference on Robotics and Automation*, May 2002. pp. 933-938.

58. D. L. James and D. K. Pai, "Real Time Simulation of Elastokinematic Models," in Proceedings of the IEEE *International Conference on Robotics and Automation*, May 2002. pp. 927-932.

59. K. E. MacLean, M. J. Shaver and D. K. Pai, "Handheld Haptics: A USB Media Controller with Force Sensing," in proceedings of the Tenth Symposium on Haptic Interfaces for Virtual Environment and Teleoperator Systems, Orlando, FL, March 24-27, 2002.

60. R. Hoskinson and D. K. Pai, "Manipulation and Resynthesis with Natural Grains," in *Proceedings of the International Computer Music Conference*, September 2001. pp. 338-341.

61. K. van den Doel and D. K. Pai, "JASS: A Java Audio Synthesis System for Programmers," in *Proceedings of the International Conference on Auditory Display*, 2001, Helsinki. pp. 150-154.

62. J. Lang and D. K. Pai, "Estimation of Elastic Constants from 3D Range-Flow" in proceedings of the Third International Conference on 3-D Digital Imaging and Modeling, 2001. pp. 331-338.

63. J. E. Lloyd and D. K. Pai, "Robotic Mapping of Friction and Roughness for Reality-based Modeling," in Proceedings of the 2001 IEEE *International Conference on Robotics and Automation*. pp. 1884–1890.

64. D. K. Pai, J. Lang, J. E. Lloyd, and J. L. Richmond, "Reality-based Modeling with ACME: A Progress Report," in proceedings of the International Symposium on Experimental Robotics, Honolulu, December 10-13, 2000. pp. 121-130.

65. D. DiFilippo and D. K. Pai, "The AHI: An Audio and Haptic Interface for Contact Interactions," in Proceedings of UIST'00 (13th Annual ACM Symposium on User Interface Software and Technology), San Diego, California, November 5-8, 2000, pp. 149–158.

66. I. Chau, S. E. Salcudean, and D. K. Pai, "HFSM-based Software Implementation of Haptic Interactions," in Proceedings of the ASME Annual Symposium on Haptic Interfaces for Virtual Environment and Teleoperator Systems, IMECE, Orlando, FL, Nov 5-10, 2000. 9 pages.

67. D. K. Pai, U. M. Ascher, and P. G. Kry "Forward Dynamics Algorithms for Multibody Chains and Contact," in Proceedings of the 2000 IEEE *International Conference on Robotics*

and Automation, San Francisco, April 2000, pp. 857–863.

68. J. L. Richmond and D. K. Pai, "Active Measurement and Modeling of Contact Sounds," in Proceedings of the 2000 IEEE *International Conference on Robotics and Automation*, San Francisco, April 2000, pp. 2146–2152.

69. D. DiFilippo and D. K. Pai, "Contact Interaction with Integrated Audio and Haptics," in Proceedings of the International Conference on Auditory Display, Atlanta, April 2-5, 2000. 6 pages.

70. J. L. Richmond and D. K. Pai, "Robotic Measurement and Modelling of Contact Sounds," in Proceedings of the International Conference on Auditory Display, Atlanta, April 2-5, 2000. 4 pages.

71. D. K. Pai, "Robotics in Reality-based Modeling," in proceedings of the International Symposium on Robotics Research, Snowbird, UT, October 8-12, 1999. Also appears in *Robotics Research: the Ninth International Symposium*, Springer-Verlag. pp. 353-358, 2000.

72. J. Lang and D. K. Pai, "Bayesian Estimation of Distance and Surface Normal with a Time-of-Flight Laser Rangefinder," in proceedings of the Second International Conference on 3-D Digital Imaging and Modeling (IEEE), Ottawa, pp. 109–117, October, 1999.

73. C. Ullrich and D. K. Pai "Green's Function Contact Maps for Accurate Real Time Collisions," in Proceedings of 1999 IEEE *International Conference on Robotics and Automation*, Detroit, MI, pp.1849–1855, May 1999.

74. M. T. Mason, D. K. Pai, D. Rus, L. R. Taylor, and M. A. Erdmann, "A Mobile Manipulator," in Proceedings of 1999 IEEE *International Conference on Robotics and Automation*, Detroit, MI, pp. 2322–2327, May 1999.

75. S. K. Ralph and D. K. Pai "Computing Fault Tolerant Motions for a Robot Manipulator," in Proceedings of 1999 IEEE *International Conference on Robotics and Automation*, Detroit, MI, pp.486–493, May 1999.

76. D. K. Pai, J. Lang, J. E. Lloyd, and R. J. Woodham. "ACME, A Telerobotic Active Measurement Facility." in *Experimental Robots VI,* vol. 250 of *Lecture Notes in Control and Information Sciences*, pp. 391–400, Springer-Verlag, 2000. (Proc.Sixth International Symposium on Experimental Robotics, Sydney, Australia, March 1999).

77. M.T. Mason, D. K. Pai, D. Rus, J. Howell, L. R. Taylor, and M. A. Erdmann. "Experiments with Desktop Mobile Manipulators," in *Experimental Robots VI,* vol. 250 of *Lecture Notes in Control and Information Sciences*, pp. 37–46, Springer-Verlag 2000. (Proc.Sixth International Symposium on Experimental Robotics, Sydney, Australia, March 1999).

78. L. M. Reissell and D. K. Pai, "Optimal bounding box hierarchies for collision detection," in *Computer Vision, Graphics and Image Processing: Recent Advances*, S. Chaudhury and S. K. Nayar (eds.), (Proceedings of ICVGIP'98), New Delhi, pp. 420–428, December 1998.

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80. S. K. Ralph and D. K. Pai, "Fault Tolerant Locomotion for Walking Robots," in Proceedings of the 1997 IEEE *International Symposium on Computational Intelligence in Robotics and Automation (CIRA'97)*, Monterey, California, pp. 130–137, July 10-11, 1997.

81. J. E. Lloyd, and D. K. Pai, 'Extracting Robotic Part-mating Programs from Operator Interaction with a Simulated Environment." in proceedings of the *Fifth International Symposium on Experimental Robotics*, Barcelona, June 1997. 12 pages.

82. J. E. Lloyd, J. S. Beis, D. K. Pai, and D. G. Lowe, "Model-based Telerobotics with Vision," in Proceedings of 1997 IEEE *International Conference on Robotics and Automation*, Albuquerque, NM, April 1997. pp. 1297-1304.

83. Y. Shi and D. K. Pai, "Haptic Display of Visual Images," in *Proceedings of IEEE Virtual Reality Annual International Symposium* (VRAIS '97), Albuquerque, NM, pp. 188–191, March 1997.

84. K. van den Doel and D. K. Pai, "Synthesis of Shape Dependent Sounds with Physical Modeling," in *International Conference on Auditory Display* (ICAD'96), Xerox PARC, Palo Alto, CA, November 1996. 5 pages.

85. D. K. Pai and L.-M. Reissell, "Touching Multiresolution Curves," in Proceedings of the ASME Dynamics Systems and Control Division (Fifth Annual Symposium on Haptic Interfaces for Virtual Environment and Teleoperator Systems, Atlanta), DSC-Vol.58, pp. 427–432, November 1996.

86. J. Siira and D.K. Pai, "Haptic Textures – A Stochastic Approach," in *IEEE International Conference on Robotics and Automation*, Minneapolis, pp. 557-562, April 1996.

87. J. Siira and D.K. Pai, "Fast Haptic Textures," Short Paper. *ACM CHI 96 Conference on Human Factors in Computing Systems*, Vancouver, pp. 231–232, April 1996.

88. D. K. Pai and R. A. Barman, "Constraint Programming for Platonic Beast Legged Robots," in *IEEE International Conference on Robotics and Automation*, Minneapolis, pp. 3283–3288, April 1996.

89. D. K. Pai and L.-M. Reissell, "Multiresolution Rough Terrain Motion Planning," in *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems*, Pittsburgh, pp. 39–44, August 1995.

90. S. K. Ralph and D. K. Pai, "Detection and Localization of Unmodeled Manipulator Collisions," in *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems*, Pittsburgh, pp. 504–509, August 1995.

91. B. Cloutier, D. K. Pai, and U. M. Ascher, "The Formulation Stiffness of Forward Dynamics Algorithms and Implications for Robot Simulation," in *Proceedings of the 1995 IEEE International Conference on Robotics and Automation*, Nagoya, pp. 2816–2822, May 1995.

92. R. J. Spiteri, U. M. Ascher, and D. K. Pai, "Numerical Solution of Differential Systems with Algebraic Inequalities arising in Robot Programming," in *Proceedings of the 1995 IEEE International Conference on Robotics and Automation*, Nagoya, pp. 2373–2380, May 1995.

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100. D. K. Pai, "Robot Programming and Constraints," in *Proceedings of the First Workshop on Principles and Practice of Constraint Programming*, Newport, pp. 250–257, April, 1993. (A revised version of this paper appears as a book chapter [111].)

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104. D. K. Pai, "Programming Parallel Distributed Control of Complex Systems," in *Proceedings of the IEEE International Symposium on Intelligent Control*, pp. 426–432, September 1989.

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Edited Volumes

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Chapters in Books

109. K. van den Doel and D. K. Pai, "Modal Synthesis for Vibrating Objects," to appear in: Audio Anecdotes III Tools, Tips, and Techniques for Digital Audio, Ken Greenebaum and Ronen Barzel (Eds.), A. K. Peters, Natick, MA, September 2007.

110. D. L. James and D. K. Pai, "Modeling Deformation of Linear Elastostatic Objects" to appear in "Haptic Rendering: Foundations, Algorithms, and Applications," M. Lin and M. Otaduy (eds.), A K Peters, 2007.

111. D. K. Pai, R. Barman, and S. Ralph, "Design and Programming of Symmetric Platonic Beast Robots," in *Experimental Robotics IV*, O. Khatib and J. K. Salisbury (eds.), Springer-Verlag, 1996, pp. 548-557. (This paper was presented at the *Fourth International Symposium on Experimental Robotics*, (Stanford), June 30-July 2, 1995.)

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Videos

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115. D. K. Pai, "Simulation and Control of Human-like Walking," in *Video Proceedings of the IEEE International Conference on Robotics and Automation*, Video No. VD91047, 1991.

Conference Abstracts

116. M. C. Tresch, B. Macrie, D. K. Pai, Q. Wei, S. Sueda, "Mechanical Actions and Modeling of Proximal Hindlimb Muscles in The Rat," in 2006 Biomedical Engineering Society Annual Fall Meeting, Chicago, Illinois, October 11-14, 2006

117. D. K. Pai and S. Sueda, "Computer Simulation of Neuro-Musculo-Skeletal Systems," Program Number 993.12. Society for Neuroscience Meeting, San Diego, October 2004.

118. D. K. Pai, R. L. Klatzky, and E. P. Krotkov, "Perception of shape and material from contact sounds," Abstract of invited paper presented at the 139th meeting of the Acoustical Society of America. J. Acoust. Soc. Am., Vol. 107, No. 5, Pt. 2, May 2000, page 2817.

Other Publications

119. D. L. James and D. K. Pai, "Vertex Pressure Masks for Point-like Contact with Elastic Models,"' proceedings of the Fifth PHANToM Users Group workshop, Aspen, CO, October 28-30, 2000.

120. D. K. Pai and K. van den Doel, "Simulation of contact sounds for haptic interaction," proceedings of the PHANToM Users Group workshop, J. K. Salisbury and M. Srinivasan (eds.), MIT Endicott House, Dedham, MA, October 19–21, 1997.

121. D. K. Pai, J. Siira, and K. van den Doel, "Interactive Simulation of Physical Systems in Virtual Environments," (invited paper), in *Proceedings of the First Workshop on Simulation and Interaction in Virtual Environments*, (sponsored by ONR and ACM SIGGRAPH), Iowa City, pp. 168–171, July 13–15, 1995.

122. J. J. Little, D. G. Lowe, A. K. Mackworth, D. K. Pai, and R. J. Woodham, "Constraint-Based Visual Robotic Systems," (invited paper), in *Proceedings of the First World Congress on Intelligent Manufacturing*, Mayaguez, pp. 668–677, February 1995.

123. M. C. Leu and D. K. Pai, "A LISP-Based Environment for Simulation of Robots and Applications," (invited paper), in *Third International Conference on CAD/CAM, Robotics and Factories of the Future*, Southfield Detroit, MI, August 1988.

Invited Presentations

- "Computational Models of Neuro-Musculo-Skeletal Systems," Sensory Motor Performance Program seminar, Rehabilitation Institute of Chicago (RIC), Chicago, IL, May 4, 2007.
- "Simulation of Human Movement with Contact and Constraints," Biomedical Engineering Seminar, Northwestern University, Evanston, IL, May 3, 2007.
- "Visual Computing in Sensorimotor Biology," Opening keynote at Dagstuhl seminar on Visual Computing: Convergence of Computer Graphics and Computer Vision, Schloss Dagstuhl, Germany, April 23, 2007.
- "High Resolution Analysis of Impact Sounds and Forces," INRIA Sophia-Antipolis, France, April 20, 2007.
- "Sensorimotor Computation" Artificial Intelligence Seminar, University of Alberta, Edmonton, AB, March 30, 2007.
- "What is Sensorimotor Computation?" Digital Human Research Center, Tokyo, Japan, March 26, 2007.
- "Interaction Capture and Synthesis," Tutorial on Integration of Haptics in Virtual Environments - A Perception-Based Approach, IEEE VR 2007, Charlotte, NC, March 10, 2007.
- "Biomechanisms for Sensorimotor Control," CoSyNe workshop on Reducing the complexity of sensorimotor control, Canyons, Utah, Feb 27, 2007.
- "Multisensory Simulation of Contact," Department of Neuromotor Physiology, IRCCS Fondazione Santa Lucia, Rome, Italy, Oct. 2, 2006.
- "Contact Modeling for Rigid Bodies and Soft Hands," Public Colloquium at the IEEE-RAS/IFRR School of Robotics Science on Haptic Interaction, Paris, France, September 25, 2006.
- "The Computation of Human Movement,"

  Visual Computing Seminar, Department of Computer Science, ETH, Zürich, Switzerland, July 4, 2006.

  Robot rounds, Department of Clinical Neurosciences, University of Calgary, Calgary, AB, April 7, 2006.

  Department of Computer Science Colloquium, University of Saskatchewan, Saskatoon, SK, April 6, 2006.
- "Biomechanical modeling of muscle strands," seminar at the Neurologische Universitaetsklinik, Zürich, Switzerland, July 3, 2006.
- "Modeling and Simulation of Musculoskeletal Systems" Department of Neuromotor Physiology, IRCCS Fondazione Santa Lucia, Rome, Italy, June 28, 2006.
- "Simulation of Neuro-Musculo-Skeletal Systems," INRIA Rhône-Alpes, Montbonnot, France, June 22, 2006.

- "Interactive Multisensory Simulation of Contact," AGEIA Technologies, Inc., St. Louis, MO, April 20, 2006.
- "Fast Simulation of Musculoskeletal Biomechanics," Department Seminar, Theoretical & Applied Mechanics, Cornell University, Ithaca, NY, March 29, 2006.
- "The Computation of Human Movement," Computer Science Department, Broad-Area Colloquium, Stanford University, Palo Alto, CA, Nov. 28, 2005.
- "Synthesis of Multisensory Interaction," Institute Colloquium, Max Planck Institute for Biological Cybernetics, Tübingen, Germany, Oct. 7, 2005.
- "Multisensory Human Interaction," Computer Science Colloquium, Rensselaer Polytechnic Institute, Troy, NY, September 22, 2005.
- "Human Movement and Contact," Media Research Lab, New York University, NY, May 6, 2005.
- "Human Movement and Contact," Teruko Yata Distinguished Lecture, Carnegie Mellon University Pittsburgh, PA, April 28, 2005.
- "Human Movement Computation: from science to cinema," Computational Science and Engineering Seminar, McGill University, Montreal, Canada, March 4, 2005.
- "Multisensory Interaction," Department of Computer Science Seminar, Stevens Institute of Technology, Hoboken, NJ, February 28, 2005.
- "Multisensory Interaction," Keynote address, Annual meeting of AFIG (Association Française d'Informatique Graphique), Poitiers, France. November 25, 2004.
- "Human Sensori-Motor Computation," Department of Computer Science, University of British Columbia, Vancouver, Canada. October 29, 2004.
- "Contact Simulation for Multisensory Interaction," INRIA Rhône-Alpes, Montbonnot, France, August 30, 2004.
- "Contact and Human Movement," Honda R&D Americas, Mountain View, CA, July 22, 2004.
- "Multisensory Simulation and Interaction," Neuroscience Seminar Series, Department of NeuroScience, University of Minnesota, December 12, 2003.
- "Multisensory Simulation and Interaction," Distinguished Lecture Series, Department of Computer Science, University of Pennsylvania, PA, November 6, 2003.
- "The HAVEN for Multisensory Interaction," Computer Science Department, Princeton University, NJ, October 6, 2003.
- "Multisensory Interaction," Dept. of Computer Science, University of California at Berkeley, CA, August 28, 2003.
- "Multisensory Simulation and Modeling," Honda R&D Americas, Mountain View, CA, August 12, 2003.

- "Interactive Simulation of Contact and Deformation," Department of Mechanical Engineering and Mechanics, Drexel University, Philadelphia, PA. April 11, 03.
- "Geometric Problems in Ultrasound Imaging," DIMACS Workshop on Medical Applications in Computational Geometry (organizers: Chen and Latombe). Piscatway, NJ. April 4, 2003.
- "Multisensory Simulation and Interaction."

  Computer Science Department, Rice University, Houston, TX. January 27, 2003.

  Distinguished Lecture Series, Computer Vision and Graphics Center, Computer Science Department, Columbia University, NY, NY. Dec 4, 2002.
- "Motion, Constraints, and Contact," DIMACS Workshop on Algorithmic Issues in Modeling Motion (organizers: Agarwal and Guibas). Piscataway, NJ. November 18, 2002.
- "Multisensory Interactive Animation," Workshop on the Mathematics of Computer Animation. The Fields Institute for Research in Mathematical Sciences. Toronto, ON. Nov 9, 2002.
- "Tradeoffs in Interactive Simulation for Surgery," Stanford Workshop on Surgical Simulation, Stanford University, Palo Alto, CA, June 20-22, 2001.
- "Contact Simulation with visual, auditory, and haptic interaction" and "Dynamics Algorithms," Institute for Mathematics and its Applications. Workshop on Haptics, Virtual Reality, and Human Computer Interaction, Minneapolis, MN. June 14 - 15, 2001.
- "Tangible Simulation: Computational models for visual, auditory, and haptic interaction"

  Computer Science Department, Rutgers University, New Brunswick, NJ, May 1, 2001.

  Computer Science Department, Princeton University, Princeton, NJ, April 30, 2001.

  Computer Science Department, Broad-Area Colloquium, Stanford University, Palo Alto, CA, April 16, 2001.
- "Manufacturing Content: Building multimodal computational models of real objects,"

  Dept. of Mechanical Engineering, U. Delaware, Newark, DE, November 17, 2000.

  Dept. of Computer Science, U. Toronto, Toronto, ON, October 17, 2000.

  Brain, Behaviour and Cognitive Science Seminar, Queen's University, Kingston, ON, October 16, 2000.
- "Motion in robotics," position paper presented at the NSF Modeling Motion Workshop (P. Agarwal and L. Guibas, organizers), Duke University, Durham, NC, August 6-7, 2000.
- "Perception of shape and material from contact sounds," presented at the 139th meeting of the Acoustical Society of America. Abstract of invited paper by D. K. Pai, R. L. Klatzky, and E. P. Krotkov appears in J. Acoust. Soc. Am., Vol. 107, No. 5, Pt. 2, May 2000, page 2817.
- "Contact Sounds in Interactive Virtual Environments," International Workshop on Acoustic Ecology, Peter Wall Institute, Vancouver, BC, February 12, 2000.
- "Get Real," Electronic Arts, Inc., Burnaby, BC, January 20, 2000.

- "Simulating Realistic Contact Sounds and Related Phenomena," Unilever SPARK workshop on "Visualisation and Virtual Environments," Liverpool, UK, Nov 29-30, 1999.
- Keynote speech, "Touching Geometry", 11th Canadian Conference on Computational Geometry, Vancouver, BC, August 17, 1999.
- "Towards Realistic Models of Contact: deformation, force, and sound," Workshop on Motion Support in Virtual Prototyping,Stanford Computer Forum, Stanford University, Palo Alto, CA. May 5-7, 1999.
- "ACME, A Telerobotic Measurement Facility for Reality Based Modeling on the Internet," Workshop on Robots on the Web, 1998 IEEE/RSJ International Conference on Intelligent Robots and Systems, Victoria, BC, October 12-16, 1998.
- "Building Simulated Environments which Sound and Feel Real"

  Centre for Artificial Intelligence and Robotics, Bangalore, India, December 17, 1998.

  University of Bath, Bath, UK, March 19, 1998.

  Institut de Recherche et Coordination Acoustique/Musique (IRCAM), Paris, France, March 16, 1998.

  Robotics Institute Seminar, Carnegie Mellon University, Pittsburgh, PA, January 30, 1998.

  Mitsubishi Electric Research Laboratory, Cambridge, MA, October 23, 1997.

  Interval Research, Palo Alto, CA, February 21, 1997.

  Department of Computer Science, Dartmouth College, Hanover, NH, February 18, 1997.
- "Real Simulation for Virtual Reality: Sound and Motion,"

  Graphics, Visualization, and Usability Center, College of Computing, Georgia Institute of Technology, Atlanta, GA, November 20, 1996.

  Department of Computer Science Colloquium, University of Utah, Salt Lake City, UT, May 2, 1996.
- "Design and programming of Platonic Beasts, a new family of symmetric multi-limbed robots,"

  Department of Electrical Engineering and Computer Science, University of Michigan, Ann Arbor, MI. November 3, 1995.

  Robotics Institute Seminar, Carnegie Mellon University, Pittsburgh, PA, September 29, 1995.

  AI Seminar, The Beckman Institute, University of Illinois at Urbana-Champaign, IL, July 11, 1995.

  Dept. of Electrical Engineering, University of Washington, Seattle, WA, April 28, 1995.

  Centre for Intelligent Machines, McGill University, Montreal, December 9, 1994.
- "Symmetric, Multi-limbed Robots: Ideas, Experiments, and Related Issues," Annual meeting of the Canadian Institute for Advanced Research, Artificial Intelligence and Robotics Programme, at Alton, Ontario, June 24, 1994.

- "Geometric methods for simulation of planar mechanical systems," at Electrotechnical Laboratory, Agency of Industrial Science and Technology, MITI, Tsukuba, Japan, July 26, 1993.
- "Mobile Robots and Constraints," at Mechanical Engineering Laboratory, Agency of Industrial Science and Technology, MITI, Tsukuba, Japan, July 23, 1993.
- "New Paradigms for Walking Robots," IRIS/CIAR Workshop on Cognitive Robotics, Ottawa, June 8, 1993.
- "New directions in Robot Locomotion," Keynote speaker, Engineering Physics Project Fair, University of British Columbia, March 4, 1993.
- "Programming and Simulation of Walking Robots," Computer Science Department, Western Washington University, Bellingham, WA, Oct 16, 1992.
- "Motion Constraints in Assembly Design and Robot Programming," Annual meeting of the Canadian Institute for Advanced Research, Artificial Intelligence and Robotics Programme, at Ayer's Cliff, Quebec, June 13, 1992.
- "Programming Complex Mechanical Systems, with applications to Dynamic Walking."

  Computer Science Department, University of Chicago, Chicago, IL, April 29, 1991.

  Computer Science Department, University of Iowa, Iowa City, IA, April 15, 1991.

  Xerox MESL, Tarrytown, NY, April 11, 1991.

  Computer Science Department, University of British Columbia, Vancouver, B.C., April 8, 1991.

  Computer Science Department, Dartmouth College, Hanover, NH, April 3, 1991.

  Robotics Institute, Carnegie Mellon University, Pittsburgh, PA, March 8, 1991.

- "New Computer Techniques in Assembly and Control," Systems and Industrial Engineering Department, University of Arizona, Tucson, AZ, April 18, 1991.
- "Dynamic Walking: Programming, Control, and Simulation," Sibley School of Mechanical and Aerospace Engineering, Cornell University, Ithaca, NY, February 19, 1991.
- "Dynamic Walking: Programming, Control, and Simulation," Computer Science Department, Rensselaer Polytechnic Institute, Troy, NY, January 31, 1991.
- "New Computer Techniques in Assembly and Control," Mechanical Engineering Department, University of Maryland, College Park, MD, September 14, 1990.
- "Complex and Simple Machines: On Walking and Assembly," Electrical Engineering Department, University of Maryland, College Park, MD, May 2, 1990.
- "Complex and Simple Machines: On Walking, Assembly, and Singularity."

  Mechanical Engineering Department, University of Southern California, Los Angeles, CA, April 27, 1990.

  Computer and Information Sciences, University of Massachusetts, Amherst, MA, April 24, 1990.

  - "Programming Parallel Distributed Control of Complex Systems," at *IEEE International Symposium on Intelligent Control*, Albany, NY, September 1989.

- "Parallel Distributed Control of Complex Systems," Martin-Marietta, Baltimore, MD, June 21, 1989.

Other Presentations

- "Simulation for Design of Feeding and Orienting Systems," Vibromatic Inc., Noblesville, IN, July 12, 1995.

- "Constraint-Based Visual Robotic Systems," 1995 IRIS/PRECARN Conference, Vancouver, BC, June 15, 1995.

- "Legged Locomotion on Rough Terrain," Atomic Energy of Canada, Ltd., Sheridan Park Engineering Laboratory, Toronto, April 28, 1995.