

Chapter 8 BIBLIOGRAPHY

- [1] AAMAS. *ACUMEN: Amplifying Control and Understanding of Multiple ENtities*, Bologna, Italy, July 15-19 2002. ACM 1-58113-480-0/02/0007.
- [2] J.K. Aggarwal, Q. Cai, and W. Liao, “Nonrigid motion analysis: articulated and elastic motion” *Computer Vision and Image Understanding* 70, no. 2 (May 1998) : 142-56.
- [3] J. M. Allbeck and N. I. Badler. Avatars á la snow crash. *Computer Animation*, pages 19–24, June 1998.
- [4] J. M. Allbeck and N. I. Badler. Consistent communication with control. Workshop on Non-Verbal and Verbal Communicative Acts to Achieve Contextual Embodied Agents, Autonomous Agents, 2001.
- [5] J. M. Allbeck and N. I. Badler. Toward representing agent behaviors modified by personality and emotion. *Embodyed Conversational Agents at AAMAS'02*, July 15-19 2002.
- [6] K. Ashida, S.-J. Lee, J. M. Allbeck, H. Sun, N. I. Badler, and D. Metaxas. Pedestrians: Creating agent behaviors through statistical analysis of observation data. *Proc. Computer Animation*, 2001.
- [7] J. Assa, Y. Caspi, D. Cohen-Or, “Action Synopsis : Pose selection and illustration” *ACM Transaction on Graphics (SigGraph 2005)* 24(3) (July 2005) : 667-676.
- [8] C. Babski and D. Thalmann. Real-time animation and motion capture in web human director. *VRML*, 2000.
- [9] N. Badler, J. Allbeck, L. Zhao, and M. Byun. Representing and parameterizing agent behaviors. January 4 2002.
- [10] N. Badler, M. Costa, L. Zhao, and D. Chi. To gesture or not to gesture: What is the question? In *Proceedings of Computer Graphics International*, pages 3–9, Geneva, Switzerland, June 2000. IEEE CS.
- [11] N. I. Badler. *Dance Technology: Current Applications and Future Trends*, chapter A Computational Alternative to Effort Notation, pages 23–44. National Dance Association, va edition, 1989.
- [12] N. I. Badler, K. H. Manoochehri, and D. Baraff. Multi-dimensional input techniques and articulated figure positioning by multiple constraints. *Workshop on Interactive 3D Graphics*, pages 151–169, October 23 1986.
- [13] N. I. Badler. Animation 2000++. *IEEE Computer Graphics and Applications*, pages 28–29, January/February 2000.
- [14] N. I. Badler and J. M. Allbeck. *Deformable Avatars*, chapter Towards Behavioral Consistency in Animated Agents, pages 191–205. Kluwer Academic Publishers, 2001.
- [15] P. Baerlocher and R. Boulle. Task-priority formulations for the kinematic control of highly redundant articulated structures. *IROS*, 1998.

- [16] S. Bandi and D. Thalmann. A configuration space approach for efficient animation of human figures. *NRAM*, 1997.
- [17] M. Berman and D. Culpin. The statistical behaviour of some least squares estimators of the centre and radius of a circle. *Journal of the Royal Statistical Society. Series B (Methodological)*, 48(2):183–196, 1986.
- [18] R. Bindiganavale, W. Shuler, J. M. Allbeck, N. I. Badler, A. K. Joshi, and M. Palmer. Dynamically altering agent behaviors using natural language instructions. *Autonomous Agents*, pages 293–300, June 2000.
- [19] A. Bloomfield, Y. Deng, J. Wampler, P. Rondot, D. Harth, M. McManus, and N. I. Badler. A taxonomy and comparison of haptic actions for disassembly tasks. *Proceedings of the IEEE Virtual Reality Conference*, pages 225–231, March 2003.
- [20] B. Bodenheimer, C. Rose, S. Rosenthal, and J. Pella. The process of motion capture: Dealing with the data. In D. Thalmann and M. van de Panne, editors, *Eurographics Animation and Simulation*, pages 3–18, Wien, Sept 1997. Springer-Verlag.
- [21] B. Bodenheimer, C. Rose, S. Rosenthal, J. Pella, “The Process of Motion Capture: Dealing with the Data” *Eurographics CAS* (Sept. 1997): 3-18
- [22] D.A. Bolt, “Two Stage Control for High Degree of Freedom Articulated Figures” Ph.D. thesis for Computer Science, University of Colorado in Colorado Springs, (2000).
- [23] R. Boulic, P. Fua, L. Herda, M. Silaghi, J.-S. Monzani, L. Nedel, and D. Thalmann. An anatomic human body for motion capture. In *EMMSEC*, pages 1–7, Bordeaux, France, September 1998.
- [24] R. Boulic, Z. Huang, N. Magnenat-Thalmann, and D. Thalmann. Goal oriented design and correction of articulated figure motion with the track system. 1994.
- [25] R. Boulic and R. Mas. Hierarchical kinematic behaviors for complex articulated figures. 1997.
- [26] R. Boulic, R. Mas, and D. Thalmann. Position control of the center of mass for articulated figures in multiple support. 1995.
- [27] R. Boulic, R. Mas, and D. Thalmann. Interactive identification of the center of mass reachable space for an articulated manipulator. 1997.
- [28] R. Boulic and D. Thalmann. Combined direct and inverse kinematic control for articulated figure motion editing. *CGF*, 1992.
- [29] R. Boulic and D. Thalmann. Complex character positioning based on a compatible flow model of multiple supports. *IEEE Transactions on Visualization and Computer Graphics*, 3(3), July–September 1997.
- [30] L. Bretzner and T. Lindeberg. Qualitative multiscale feature hierarchies for object tracking. *Journal of Visual Communication and Image Representation*, 11:115–129, 2000.
- [31] M. Burr, A. Cheng, R. Coleman and D. Souvaine. “Transformations and Algorithms for Least Sum of Squares Hypersphere Fitting.” *16th Canadian Conference on Compu-*

- tational Geometry*, 2004, pp 104-107.
- [32] J. Chai, J. Hodgins “Performance Animation from Low Dimensional Control-Signals” *ACM Transaction on Graphics (SigGraph 2005)* 24(3) (July 1005) : 686-696.
 - [33] L. Y. Chang, N. S. Pollard, “Constrained least-squares optimization for robust estimation of center of rotation”, *Journal of Biomechanics*, (accepted 7 May 2006)
 - [34] N. Chernov and C. Lesort. “Least squares fitting of circles”. *Journal of Mathematical Imaging and Vision*, 23:239–252, 2005.
 - [35] D. Chi, M. Costa, L. Zhao, and N. I. Badler. Emote model for effort and shape. *Proceedings of SIGGRAPH*, 2000.
 - [36] K. Choi, S. Park, H. Ko. Processing motion capture data to achieve positional accuracy. *Graphical Models and Image Processing*, 61(5):260–273, September 1999.
 - [37] K. Choi and H. Ko. On-line motion retargetting. *Journal of Visualization and Computer Animation*, 11(5):223–235, June 2000.
 - [38] M.-H. Choi and J. F. Cremer. Interative manipulation of articulated objects with geometry awareness. *Proceedings of the IEEE International Conference on Robotics & Automation*, pages 592–598, May 1999.
 - [39] S. Chopra-Khullar and N. I. Badler. Where to look? automating attending behaviors of virtual human characters. 1999.
 - [40] C. A. Corral and C. S. Lindquist. On implementing Kása’s circle fit procedure. *IEEE Transactions on Instrumentation and Measurement*, 47(3):789–795, June 1998.
 - [41] P. Delogne. “Computer Optimization of Deschamps’ Method and Error Cancellation in Reflectometry,” Proceedings of the IMEKO Symposium on Microwave Measurements, *Budapest, Hungary*, May 1972, pp. 117-129.
 - [42] Q. Delamarre and O. Faugeras. 3D Articulated Models and Multiview Tracking with Physical Forces. *Computer Vision and Image Understanding*, 81:328–357, 2001.
 - [43] E-Factory. *Jack human modeling and simulation - Virtual people, virtual places, real solutions*.
 - [44] R. M. Ehrig, W. R. Taylor, G. N. Duda, M. O. Heller, “A survey of formal methods for determining the centre of rotation of ball joints”, *Journal of Biomechanics* (accepted 3 October 2005)
 - [45] P.J. Frey “MEDIT: An interactive mesh visualization software” Rapport technique n°0253, December 3, 2001, 41 pages.
 - [46] P. Fua, R. Plänkers, and D. Thalmann. From synthesis to analysis: Fitting human animation models to image data. *CGI*, 1999.
 - [47] W. Gander, G.H. Golub, R. Strelbel. “Least-Squares Fitting of Circles and Ellipses”. *BIT Numerical Mathematics* 34, Springer 1994, pp 558-578.
 - [48] C. R. Henderson. Estimation of variance and covariance components. *Biometrics*, 9(2):226–252, June 1953.

- [49] L. Herda, P. Fua, R. Plänkers, R. Boulic, and D. Thalmann. Using skeleton-based tracking to increase the reliability of optical motion capture. *HMS*, 2001.
- [50] [L. Herda, P. Fua, R. Plankers, R. Boulic, D. Thalmann, “Skeleton-based motion capture for robust reconstruction of Human Motion”, Computer Graphics Lab \(LIG\) EPFL:Lausane, Switzerland \(2000\).](#)
- [51] R.J. Holt, T.S. Huang, and A.N. Netravali, R.J. Qian, “Determining articulated motion from perspective views: a decomposition approach” *Pattern Recognition*: 30, no. 9, (1997): 1435.
- [52] S. Jung and K. Wohn. Tracking and motion estimation of the articulated object: a hierarchical Kalman filter approach. *Real-Time Imaging*, 3:415–432, 1997.
- [53] T. Jung. An algorithm with logarithmic time complexity for interactive simulation of hierarchically articulated bodies using a distributed-memory architecture. *Real-Time Imaging*, 4:81–96, 1998.
- [54] P. E. Jupp and J. T. Kent. Fitting smooth paths to spherical data. *Applied Statistics*, 36(1):34–46, 1987.
- [55] K. Kanatani. “Cramér-Rao lower bounds for curve fitting.” *Graphical Models and Image Processing*, 60(2):93–99, March 1998.
- [56] K. Kanatani. “Ellipse Fitting with Hyperaccuracy.” *IEICE Transactions on Information and Systems*, E89-D (10): 2653-2660, October 2006.
- [57] I. Kása. A circle fitting procedure and its error analysis. *IEEE Transactions on Instrumentation and Measurement*, 25:8–14, March 1976.
- [58] C. Kervrann and F. Heitz. A hierarchical markov modeling approach for the segmentation and tracking of deformable shapes. *Graphical Models and Image Processing*, 60(3):173–195, May 1998.
- [59] P. Kiriazov and H. Ko. On control design in simulation of human motion. 1998.
- [60] A. G. Kirk, J. F. O’Brien, and D. A. Forsyth. Skeletal parameter estimation from optical motion capture data. In *IEEE Conf. on Computer Vision and Pattern Recognition (CVPR)*. IEEE, 2005.
- [61] A. G. Kirk and O. Arikan. Real-time ambient occlusion for dynamic character skins. 2007.
- [62] J. K. Knight. Probability density function determination from ordered statistics. Masters thesis, California State University, Fullerton, August 1995.
- [63] [J. K. Knight and S. K. Semwal, Fast Skeleton Estimation from Motion Capture Data using Generalized Delogne-Kása method. In 15th International Conference in Central Europe on Computer Graphics Visualization and Computer Vision. Full Papers Proceedings of WSCG, ISBN 978-80-86943-01-5, Feb 2007.](#)
- [64] H. Ko, J. Cremer, “VRLOCO: Real-Time Human Locomotion from Positional Input Stream” *Presence* 5(4) (1996): 367-380.
- [65] H. Ko and N. I. Badler. Animating human locomotion in real-time using inverse dy-

- namics, balance and comfort control. *IEEE Computer Graphics and Applications*, 16(2):50–59, March 1996.
- [66] L. Kovar, M. Gleicher, F. Pighin, “Motion Graphs” *Proceedings of SIGGRAPH 2002*: 473-482.
- [67] H. K. Kwangjin Choi, Sanghyun Park. Processing motion capture data to achieve positional accuracy. *Graphical Models and Image Processing*, 61(5):260–273, September 1999.
- [68] S. P. Lee, J. B. Badler, and N. I. Badler. Eyes alive. *Proceedings of ACM SIGGRAPH*, 21(3):637–644, July 2002.
- [69] J. Lee, S.Y. Shin, “A Hierarchical Approach to Interactive Motion Editing for Human-like Figures” *Proceedings of SIGGRAPH 1999*.
- [70] J. Lee, J. Chai, P.S.A Reitsma, “Interactive Control of Avatars Animated with Human Motion Data” *Proceedings of SIGGRAPH 2002*: 491-500.
- [71] C.K. Liu, Z. Popović, “Synpaper of Complex Dynamic Character Motion from Simple Animation” *Proceedings of SIGGRAPH 2002*: 408-416.
- [72] Z. Lui, S. Gortler, M. Cohen, “Hierarchical Spacetime Control” *Computer Graphics (SIGGRAPH 1994 Proceedings)*.
- [73] G. Lukács, A.D. Marshall, R.R. Martin, “Geometric Least-Squares Fitting of Spheres, Cylinders, Cones, and Tori” RECCAD Deliverable Documents 2 and 3 Co-pernicus Project No. 1068 Reports on basic geometry and geometric model creation, etc. Edited by Dr. R. R. Martin and Dr. T. Varady Report GML 1997/5, Computer and Automation Institute, Hungarian Academy of Sciences, Budapest, 1997.
- [74] N. Magnenat-Thalmann and D. Thalmann. Motion control of synthetic actors: An integrated view of human animation. *MCAA*, 1989.
- [75] F. Marina, E. Stella, A. Branca, N. Veneziani, and A. Distante. Specialized hardware for real-time navigation. *Real-Time Imaging*, 7:97–108, 2001.
- [76] E. G. Miller. A new class of entropy estimators for multi-dimensional densities. *International Conference on Acoustics, Speech, and Signal Processing*, 2003.
- [77] T. Molet, R. Boulic, and D. Thalmann. A real time anatomical converter for human motion capture. *EGCAS*, 1996.
- [78] J.-S. Monzani, P. Baerlocher, R. Boulic, and D. Thalmann. Using an intermediate skeleton and inverse kinematics for motion retargeting. *Eurographics*, 19(3), 2000.
- [79] A. Moreno, J. Umerez, and J. Ibañez. Cognition and life: The autonomy of cognition. pages 107–129, 1997.
- [80] Motion Lab Systems, Inc. “C3D Format User Guide”, PDF document at <http://www.motion-labs.com>, Motion Lab Systems, Baton Rouge, LA, (2003) (98 pages)
- [81] M. Muller, T. Roder, M. Clausen, “Efficient Content-Based Retrieval of motion capture Data” *ACM Transaction on Graphics (SigGraph 2005)* 24(3) (July 2005) : 677-

685.

- [82] Y. Nievergelt. Perturbation analysis for circles, spheres, and generalized hyper-spheres fitted to data by geometric total least-squares. *Mathematics of Computation*, 73(245):169–180, August 2003.
- [83] J. F. O’Brien, A. W. Bargteil, and J. K. Hodgins. Graphical modeling and animation of ductile fracture. *SIGGRAPH Computer Graphics Proceedings, Annual Conference Series*, 2002.
- [84] J. F. O’Brien, R. E. Bodenheimer Jr., G. J. Brostow, and J. K. Hodgins. *Automatic Joint Parameter Estimation from Magnetic Motion Capture Data*, pages 53–60, Montreal, Quebec, Canada, May 15-17 2000. Graphics Interface.
- [85] J. F. O’Brien, P. R. Cook, and G. Essl. Synthesizing sounds from physically based motion. *SIGGRAPH Computer Graphics Proceedings, Annual Conference Series*, 2001.
- [86] J. F. O’Brien and J. K. Hodgins. Graphical modeling and animation of brittle fracture. *Computer Graphics Proceedings, Annual Conference Series*, 1999.
- [87] J. F. O’Brien and J. K. Hodgins. Animating fracture. *Communications of the ACM*, 43(7), July 2000.
- [88] J. F. O’Brien, C. Shen, and C. M. Gatchalian. Synthesizing sounds from rigid-body simulations. *ACM SIGGRAPH Symposium on Computer Animation*, 2002.
- [89] G.E. Plassman, “A Survey of Singular Value Decomposition Methods and Performance Comparison of Some Available Serial Codes” NASA CR-2005-213500, July 2005.
- [90] N.S. Pollard, P.S.A. Reitsma, “Animation of Humanlike Characters: Dynamic Motion Filtering with a Physically Plausible Contact Model” *Yale Workshop on Adaptive and Learning Systems* (2001).
- [91] Z. Popović, A. Witkin, “Physically Based Motion Transformation” *Computer Graphics Proceedings, Annual Conference Series*, 1999.
- [92] I. Potucek. Automatic image stabilization for omni-directional systems.
- [93] V. Pratt. Direct least-squares fitting of algebraic surfaces. *Computer Graphics*, 21(4):145–152, July 1987.
- [94] W.H. Press, S.A. Teukolsky, W.T. Vetterling, B.P. Flannery, “Numerical Recipes in C: The Art of Scientific Computing” 2nd.ed., Cambridge University Press: 1992.
- [95] S. Robinson, “Fitting Spheres by the Method of Least Squares” *Communications of the ACM*, Volume 4, No. 11; November 1967, p. 491.
- [96] P. L. Rosin. Further five point ellipse fitting. *Graphics Models and Image Processing*, 61:245–259, 1999.
- [97] A. Safonova, J. K. Hodgins, N. S. Pollard. “Synthesizing Physically Realistic Human Motion in Low-Dimensional, Behavior-Specific Spaces”. *ACM Transactions on Graphics*, Vol. 23 No. 3, pp. 514-521, Aug 2004.

- [98] S. Semwal, M.J. Parker, “An Animation System for Biomechanical Analysis of Leg Motion and Predicting Injuries during Cycling” *Real-Time Imaging*: 5 (1999): 109-123.
- [99] S.K. Semwal, R. Hightower, S. Stansfield, “Closed Form and Geometric Algorithms for Real-Time Control of an Avatar” *IEEE Proceedings of VRAIS 1996*.
- [100] C.M. Shakarji “Least-Squares Fitting Algorithms of the NIST Algorithm Testing System” *J. of Research of the National Institute of Standards and Technology*: 103, No. 6 (1998): 633.
- [101] A. Simonovits *Econometrica*, Vol. 43, No. 3 (May, 1975), pp. 493-498
- [102] J. Shi, N. I. Badler, and M. B. Greenwald. Joining a real-time simulation: Parallel finite-state machines and hierarchical action level methods for mitigating lag time. 2000.
- [103] M.-C. Silaghi, R. Plänkers, R. Boulic, P. Fua, and D. Thalmann. Local and global skeleton fitting techniques for optical motion capture. In N. Magnenat-Thalmann and D. Thalmann, editors, *Modelling and Motion Capture Techniques for Virtual Environments*, volume 1537 of *Lecture Notes in Artificial Intelligence*, pages 26–40, Berlin, Nov 1998. Proceedings of CAPTECH, Springer.
- [104] M.-C. Silaghi, R. Plänkers, R. Boulic, P. Fua, and D. Thalmann. Local and global skeleton fitting techniques for optical motion capture. *Captech*, 1998.
- [105] H. Späth. Least-square fitting with spheres. *Journal of Optimization Theory and Applications*, 96(1):191–199, January 1998.
- [106] [A. Strandlie, J. Woldsen, R. Frühwirth and B. Lillekjendlie. Track Fitting on the Riemann Sphere. International Conference on Computing in High Energy and Nuclear Physics, Padova, Italy; February, 2000.](#)
- [107] S. Tak and H. Ko. Example Guided Inverse Kinematics. *Proceedings of the International Conference on Computer Graphics and Imaging*, pages 19–23, 2000.
- [108] S.M. Thomas and Y.T. Chan. “Cramer-Rao Lower Bounds for Estimation of a Circular Arc Center and Its’ Radius”. *CVGIP: Graphics Model and Image Processing*, Vol. 57, No. 6, pages 527-532, 1995.
- [109] D. Tolani, A. Goswami, N.I. Badler, “Real-Time Inverse Kinematics Techniques for Anthropomorphic Limbs” *Graphical Models*: 62 (2000): 353-388.
- [110] D. Umbach and K. N. Jones. A few methods for fitting circles to data. *IEEE Transactions on Instrumentation and Measurement*, 52(6):1881–1885, December 2003.
- [111] M. van de Panne, “From Footprints to Animation” *Computer Graphics Forum*: 16, no. 4 (1997): 211-223.
- [112] G. A. Watson. Least squares fitting of circles and ellipses to measured data. *BIT*, 39(1):176–191, 1999.
- [113] Y. Wei, S. Xia, D. Zhu. “A Robust Method for Analyzing the Physical Correctness of Motion Capture Data”. *VRST*: pp. 338–341, Nov 1-3, 2006, Cyprus.

- [114] G. Welch and G. Bishop. *An introduction to the Kalman filter*. 2004.
- [115] D. J. Wiley and J. K. Hahn. “Interpolation synthesis of articulated figure motion.” *IEEE Computer Graphics and Applications*, 17(6):39–45, November/December 1997.
- [116] L. de Witte. “Least Squares Fitting of a Great Circle Through Points on a Sphere.” *Communications of the ACM*, Volume 3, No. 11, November 1960, pp. 611-613.
- [117] L. Yang, F. Albregtsen, and T. Taxt. “Fast computation of three-dimensional geometric moments using a discrete divergence theorem and a generalization to higher dimensions.” *Graphical Models and Image Processing*, 59(2):97–108, March 1997.
- [118] J. Znamenáček and M. Valášek. An efficient implementation of the recursive approach to flexible multibody dynamics. *Multibody System Dynamics*, 2(3):227–251, 1998.
- [119] E. E. Zelniker and I. V. L. Clarkson. A Generalisation of the Delogne-Kása Method for Fitting Hyperspheres. Pacific Grove, California, November 2004. Thirty-Eighth Asiomar Conference on Signals, Systems and Computers.
- [120] E. E. Zelniker and I. V. L. Clarkson. A Statistical Analysis Least-Squares Circle-Centre Estimation. In 2003 IEEE International Symposium on Signal Processing and Information Technology, December 2003, Darmstadt, Germany, pp 114-117
- [121] V.B. Zordan, A. Majkowaska, B. Chiu, M. Fast, “Dynamic Response for the Motion Capture Animation” *ACM Transaction on Graphics (SigGraph 2005)* 24(3) (July 2005) : 686-701.
- [122] V.B. Zordan, N. C. Van Der Horst, “Mapping Optical Motion Capture Data to Skeletal Motion Using a Physical Model” *Eurographics/SIGGRAPH Symposium on Computer Animation* (2003) : 245-250.

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