15-464 / 15-664 Reference List for 1/31/2012 lecture

Motion Capture Data and Motion Graph Search

Traditional motion graph approaches performed best with local guidance. Otherwise, the search tree was too large to explore efficiently. Notice the large number of constraints that help to define the motion and relatively short motion sequences in the videos.

Kovar, Lucas, Michael Gleicher, and Frederic Pighin. "Motion graphs." ACM Transactions on Graphics (2002): 473-482. http://research.cs.wisc.edu/graphics/Gallery/kovar.vol/MoGraphs/

Alla Safonova and Jessica K. Hodgins, "Construction and optimal search of interpolated motion graphs," ACM Transactions on Graphics Journal, SIGGRAPH 2007 Proceedings, August 2007. http://graphics.cs.cmu.edu/projects/interpolated_motion_graphs/

Wan-Yen Lo and Matthias Zwicker, "Bidirectional Search for Interactive Motion Synthesis," Computer Graphics Forum (Eurographics 2010). http://graphics.ucsd.edu/~wanyen/Wan-Yen_Lo/BiSearch.html

A few researchers created simpler motion graphs more in the style of games, which even still use relatively few motions for basic locomotion and blend trees or procedural modifications to create intermediate motions.

Gleicher, Michael, Hyun Joon Shin, Lucas Kovar, Andrew Jepsen, Shin Lucas, and Kovar Andrew Jepsen. "Snap-Together Motion: Assembling Run-Time Animations." In ACM Transactions on Graphics. 2003. http://research.cs.wisc.edu/graphics/Gallery/kovar.vol/SnapTogetherMotion/

These simple motion graphs can be more easily searched, and search trees can be precomputed for very fast search. This is important given the low computational budget usually allotted to character planning and AI in games.

Manfred Lau and James Kuffner. 2006. Precomputed Search Trees: Planning for Interactive Goal-Driven Animation. ACM SIGGRAPH / Eurographics Symposium on Computer Animation (SCA), 299-308. http://graphics.cs.cmu.edu/projects/precomputed_search_trees/

LEVINE S., LEE Y., KOLTUN V., POPOVI´C Z.: Spacetime planning with parameterized locomotion controllers. ACM Trans. Graph. 30 (May 2011), 23:1–23:11. http://www.stanford.edu/~svlevine/

Reinforcement Learning

Some researchers observed that the search could be essentially precomputed by learning a value function that mapped each state to a new action.

TREUILLE A., LEE Y., POPOVI´C Z.: Near-optimal character animation with continuous control. ACM Trans. Graph. 26 (July 2007). http://grail.cs.washington.edu/projects/graph-optimal-control/

Wan-Yen Lo and Matthias Zwicker, "Real-Time Planning for Parameterized Human Motion," ACM SIGGRAPH / Eurographics Symposium on Computer Animation, 2008. http://graphics.ucsd.edu/~wanyen/Wan-Yen_Lo/RTPlanning.html

Lee, s. Popović, Z., "Learning Behavior Styles with Inverse Reinforcement Learning," ACM Transactions on Graphics 29(3) (SIGGRAPH 2010). http://grail.cs.washington.edu/projects/learning-behavior-styles/

In this paper, improvement in the performance of the value function guides which set of clips to select from a motion database:

LEE Y., LEE S. J., POPOVI´C Z.: Compact character controllers. ACM Trans. Graph. 28 (December 2009), 169:1–169:8. http://grail.cs.washington.edu/projects/trans-graph/s2009/

As state representations become more complex, the results approach motions that can be achieved through higher level path planning.

Leslie Ikemoto, Okan Arikan, David Forsyth, "Learning to Move Autonomously in a Hostile World", Berkeley Technical Report 2005. http://www.leslieikemoto.com/Papers/Entries/2005/6/1_Autonomous_characters.html

Wan-Yen Lo, Claude Knaus, and Matthias Zwicker, "Learning Motion Controllers with Adaptive Depth Perception," ACM SIGGRAPH / Eurographics Symposium on Computer Animation, 2012. http://graphics.ucsd.edu/~wanyen/Wan-Yen_Lo/DepthPerception.html

Early use of Complete Motion Planning Algorithms in Computer Animation (using Randomized Path Planning)

Yoshihito Koga, Koichi Kondo, James Kuffner, and Jean-Claude Latombe, In Proceedings of SIGGRAPH 94, July, 1994, pp. 395 - 408.
http://www.ri.cmu.edu/pub_files/pub4/koga_yoshihito_1994_1/koga_yoshihito_1994_1.pdf

Barraquand, Jerome and Latombe, Jean-Claude. "Robot Motion Planning: A Distributed Representation," Approach. Int. J. Robotics Research, 10(6), December 1991, 628-649.
http://www.dtic.mil/dtic/tr/fulltext/u2/a209890.pdf

Rapidly Exploring Random Trees (RRTs)

LAVALLE S. M., KUFFNER J. J.: Rapidly-exploring random trees: Progress and prospects. In Algorithmic and Computational Robotics: New Directions (2000), pp. 293–308. http://msl.cs.uiuc.edu/rrt/

KUFFNER J. J., LAVALLE S. M.: Rrt-connect: An efficient approach to single-query path planning. In Proc. IEEE ICRA (2000), pp. 995–1001.

Katsu Yamane, James Kuffner, and Jessica K Hodgins, "Synthesizing Animations of Human Manipulation Tasks," ACM Trans. on Graphics (Proc. SIGGRAPH 2004). http://graphics.cs.cmu.edu/projects/planning/

SHAPIRO, A., KALLMANN, M., AND FALOUTSOS, P. 2007. Interactive motion correction and object manipulation. In Symposium on Interactive 3D graphics and games, ACM, 137–144.
http://graphics.ucmerced.edu/projects/07-i3d-manip/

Probabilistic Roadmaps (PRMs)

CHOI M. G., LEE J., SHIN S. Y.: Planning biped locomotion using motion capture data and probabilistic roadmaps. ACM Trans. Graph. 22 (April 2003), 182–203.
http://mrl.snu.ac.kr/research/ProjectPlanning/planning.htm

Moving Obstacles out of the Way

M. Stilman and J. Kuffner. Planning Among Movable Obstacles with Artificial Constraints. International Journal of Robotics Research. 12. 2008. http://www.golems.org/node/1237