15-464/15-664 Reference List for March 29, 2017

We started by looking at a high level at the development of the finite element method in this paper:

O'brien, James F., and Jessica K. Hodgins. "Graphical modeling and animation of brittle fracture." In *Proceedings of the 26th annual conference on Computer graphics and interactive techniques*, pp. 137-146. ACM Press/Addison-Wesley Publishing Co., 1999. http://graphics.berkeley.edu/papers/Obrien-GMA-1999-08/index.html

The following paper discusses how to make the approach robust to large deformations, including element inversion:

Irving, Geoffrey, Joseph Teran, and Ron Fedkiw. "Invertible finite elements for robust simulation of large deformation." In *Proceedings of the 2004 ACM SIGGRAPH/Eurographics symposium on Computer animation*, pp. 131-140. Eurographics Association, 2004. http://dl.acm.org/citation.cfm?id=1028541

The basic finite element technique discussed in these papers was extended to simulate goop:

Goktekin TG, Bargteil AW, O'Brien JF. A method for animating viscoelastic fluids. InACM Transactions on Graphics (TOG) 2004 Aug 8 (Vol. 23, No. 3, pp. 463-468). ACM. http://graphics.berkeley.edu/papers/Goktekin-AMF-2004-08/

A similar approach was used in our research on real-time character control:

Kim J, Pollard NS. Fast simulation of skeleton-driven deformable body characters. ACM Transactions on Graphics (TOG). 2011 Oct 1;30(5):121. http://www.cs.cmu.edu/~junggon/projects/fastsimuldbody/fastsimuldbody.htm

This 2016 SIGGRAPH paper uses model reduction for real-time simulation of deformations with the goal of incorporating finite element techniques into the conventional artist pipeline:

Xu H, Barbič J. Pose-space subspace dynamics. ACM Transactions on Graphics (TOG). 2016 Jul 11;35(4):35. http://run.usc.edu/multiModal/

Although I did not discuss it in class, this paper is a good introduction to model reduction.

Barbič, Jernej, and Doug L. James. "Real-time subspace integration for St. Venant-Kirchhoff deformable models." In *ACM Transactions on Graphics (TOG)*, vol. 24, no. 3, pp. 982-990. ACM, 2005. http://graphics.cs.cmu.edu/projects/stvk/

For additional reference, here are two more interesting papers which look at how finite element simulation for character skinning can be made fast and be fit into the typical animator pipeline:

McAdams, Aleka, Yongning Zhu, Andrew Selle, Mark Empey, Rasmus Tamstorf, Joseph Teran, and Eftychios Sifakis. "Efficient elasticity for character skinning with contact and collisions." In *ACM Transactions on Graphics (TOG)*, vol. 30, no. 4, p. 37. ACM, 2011. http://pages.cs.wisc.edu/~sifakis/projects.html

Hahn, Fabian, Sebastian Martin, Bernhard Thomaszewski, Robert Sumner, Stelian Coros, and Markus Gross. "Rig-space physics." *ACM Transactions on Graphics (TOG)* 31, no. 4 (2012): 72.
https://graphics.ethz.ch/publications/papers/paperHahn12.php

Finally, we concluded by discussing Projective Dynamics, which is inspired by the idea of combining ideas from Finite Element simulation and point based dynamics to produce fast simulations that can achieve a variety of effects.

Bouaziz S, Martin S, Liu T, Kavan L, Pauly M. Projective dynamics: fusing constraint projections for fast simulation. ACM Transactions on Graphics (TOG). 2014 Jul 27;33(4):154.
https://www.cs.utah.edu/~ladislav/bouaziz14projective/bouaziz14projective.html

The Projective Fluids paper which we found in class is here:

Weiler M, Koschier D, Bender J. Projective fluids. InProceedings of the 9th International Conference on Motion in Games 2016 Oct 10 (pp. 79-84). ACM.
http://www.interactive-graphics.de/index.php/research/104-projective-fluids