15-464/15-664 Reference List for March 27, 2019

We started by looking 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

There are ways to make this kind of simulation run faster. 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/

We had a look at two recent papers:

Smith, Breannan, Fernando De Goes, and Theodore Kim. "Stable neo-hookean flesh simulation." *ACM Transactions on Graphics (TOG)* 37, no. 2 (2018): 12.
https://dl.acm.org/citation.cfm?id=3180491

Pan, Zherong, and Dinesh Manocha. "Active animations of reduced deformable models with environment interactions." *ACM Transactions on Graphics (TOG)* 37, no. 3 (2018): 36.
https://arxiv.org/abs/1708.08188

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