

## 15-464/15-664 Reference List for March 27, 2017

### PIC and FLIP

We started out by following up last Wednesday's discussion of offline Eulerian fluid simulation with a short overview of PIC and FLIP methods. You can find detailed references in the course notes and slides:

SIGGRAPH 2007 course: Robert Bridson and Matthias Müller-Fischer, "Fluid Simulation for Computer Animation" <http://www.cs.ubc.ca/~rbridson/fluidsimulation/>

### Fluid control

Next, I spoke about fluid control – how do we coerce a fluid into taking on keyframes. The go-to references are the first two, while the third shows an extension by previous 15-464 students.

Fattal, Raanan, and Dani Lischinski. "Target-driven smoke animation." In *ACM Transactions on Graphics (TOG)*, vol. 23, no. 3, pp. 441-448. ACM, 2004.

McNamara, Antoine, Adrien Treuille, Zoran Popović, and Jos Stam. "Fluid control using the adjoint method." In *ACM Transactions On Graphics (TOG)*, vol. 23, no. 3, pp. 449-456. ACM, 2004.  
<http://grail.cs.washington.edu/projects/control/>

Alfred Barnat, Zeyang Li, James McCann, and Nancy S. Pollard, Mid-Level Smoke Control for 2D Animation, Proceedings of Graphics Interface 2011 <http://graphics.cs.cmu.edu/projects/mlsc/>

### Fluid for games

A good intro to fluid for games can be found in the SIGGRAPH 2007 course information listed above. First techniques to consider may still include procedural water and heightfields.

Procedural water has a long history as you might expect. I mentioned Darwin Peachey's paper on the topic, which you can find here.

Peachey, Darwyn R. "Modeling waves and surf." *ACM Siggraph Computer Graphics*. Vol. 20. No. 4. ACM, 1986. <http://dl.acm.org/citation.cfm?id=15893>

Also check out this paper for procedural waves:

A. Fournier and W. T. Reeves. A simple model of ocean waves, SIGGRAPH 86, pages 75–84  
<http://dl.acm.org/citation.cfm?id=15894>

Here is a good explanation of a heightfield technique:

J. O'Brien and J. Hodgins, Dynamic simulation of splashing fluids, In Computer Animation 95, pages 198–205 <http://graphics.berkeley.edu/papers/Obrien-DSS-1995-04/>

## SPH for fast fluid simulation

To get started on SPH simulation, this is the go-to paper:

Müller, Matthias, David Charypar, and Markus Gross. "Particle-based fluid simulation for interactive applications." In Proceedings of the 2003 ACM SIGGRAPH/Eurographics symposium on Computer animation, pp. 154-159. Eurographics Association, 2003.  
<http://www.matthiasmueller.info/publications/sca03.pdf>

## Fluids Motion Capture

We also talked about using real-world images or 3D point clouds to help guide a simulation. Here are the examples we saw:

Wang, Huamin, Miao Liao, Qing Zhang, Ruigang Yang, and Greg Turk. "Physically guided liquid surface modeling from videos." In *ACM Transactions on Graphics (TOG)*, vol. 28, no. 3, p. 90. ACM, 2009.  
<http://vis.uky.edu/~gravity/Research/WaterRec/WaterRec.html>

Li, Chuan, David Pickup, Thomas Saunders, Darren Cosker, David Marshall, Peter Hall, and Philip Willis. "Water surface modeling from a single viewpoint video." *Visualization and Computer Graphics, IEEE Transactions on* 19, no. 7 (2013): 1242-1251. <http://www.staff.science.uu.nl/~li000042/Water.html>

Gregson, James, Ivo Ihrke, Nils Thuerey, and Wolfgang Heidrich. "From Capture to Simulation-Connecting Forward and Inverse Problems in Fluids." *ACM Transactions on Graphics* 33 (2014): 11.  
<http://www.cs.ubc.ca/labs/imager/tr/2014/FromCaptureToSimulation/#files>

## **SIGGRAPH 2013 course**

You may find this course interesting:

[Nils Thuerey, Theodore Kim, Tobias Pfaff, "Turbulent Fluids,"](http://www.ntoken.com/course2013.html) <http://www.ntoken.com/course2013.html>