Project 5

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CSCI 444 – Data Visualization

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Hypothesis

“The density of the fluid or material directly affects the velocity of the particles. Denser fluids have much less velocity among its particles while fluids that are less dense will have greater velocity among its particles.”

Good Visuals

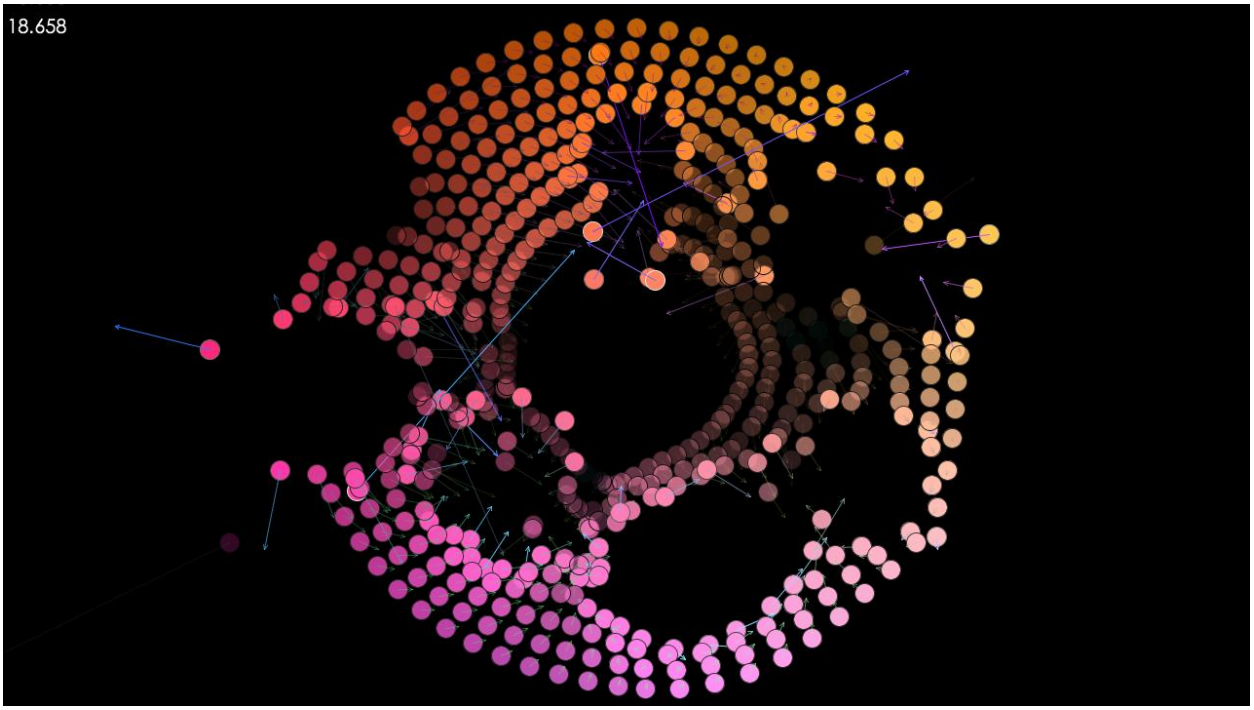

Fig. 1 (Snapshot of this video: http://vimeo.com/4626213)

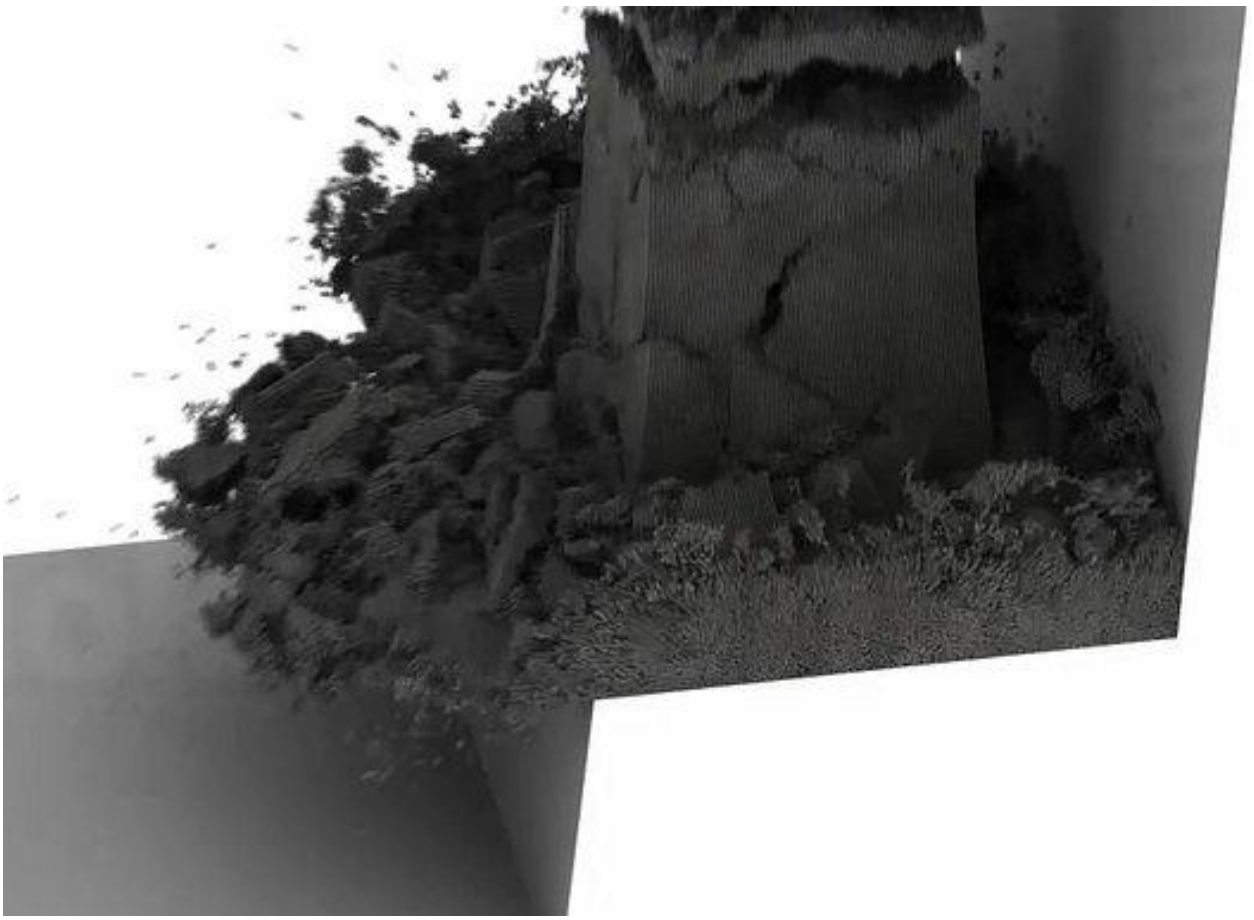

Fig. 2 (Snapshot of this video: http://vimeo.com/thiagocosta/lagoamultiphysics)

Bad Visual

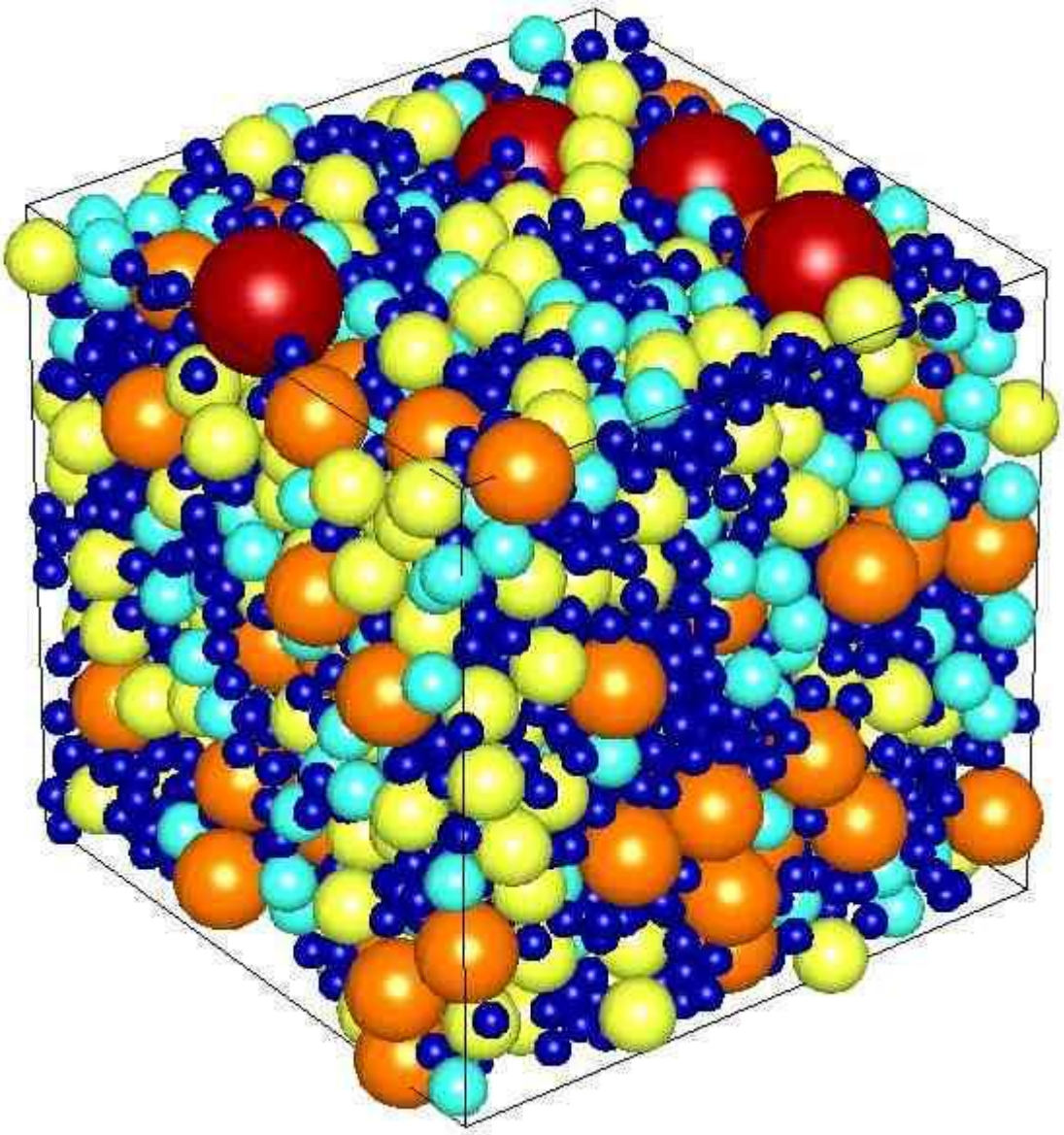

Fig. 3

Visual Explanation

I got my first good visual (fig. 1) off of Reza Ali [1][2], which is a blog for data visualization. It is an example of a particle simulator that reacts based on the position of the mouse cursor. I thought this worked well as a visual because it showed how the particles in this program interact with the cursor position. I included the URL to the website I found this on because it has some really good particle simulators and visualizations that play along with some music, as well as some 3D modeling software.

The other good visual (fig. 2) I found off of popsci[3]. It is a particle-based simulator, which allows the artist to create different types of materials and then decimate them. I thought it worked pretty well as a visual because it showed the actual particles and how they interacted, which is similar to what we were doing in the openGL programming. This program does a very good job of visualizing the particle reactions of different materials and fluids.

The bad visual (fig. 3) I found off the Tungsten Spheres website [4]. It is a visual explaining their "breakthrough algorithm" for achieving maximum 3D density. At first, I liked this visual because it showed a similar concept to what my visuals showed in reference to density of materials. However, after I found my good visuals, I felt much differently about how they represented the particles. There are many good tools out there to present quality visuals that this doesn't quite make the grade.

openGL Visuals

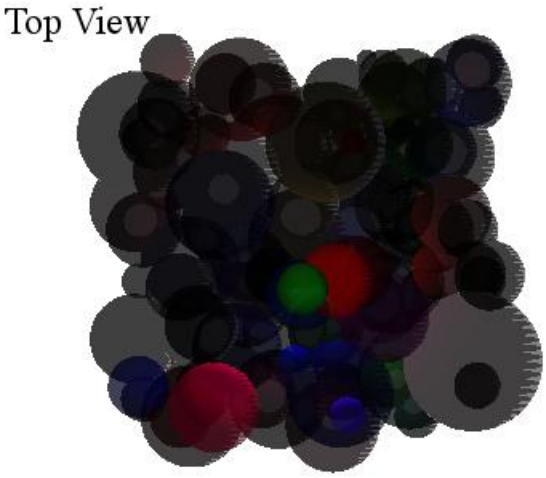

Fig. 4

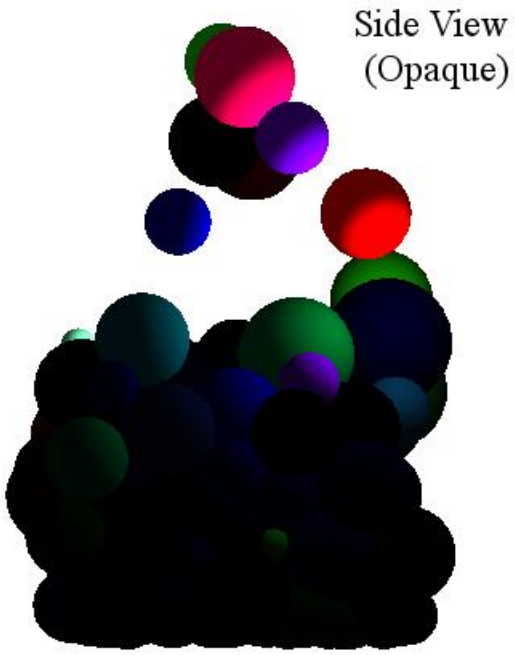

Fig. 5

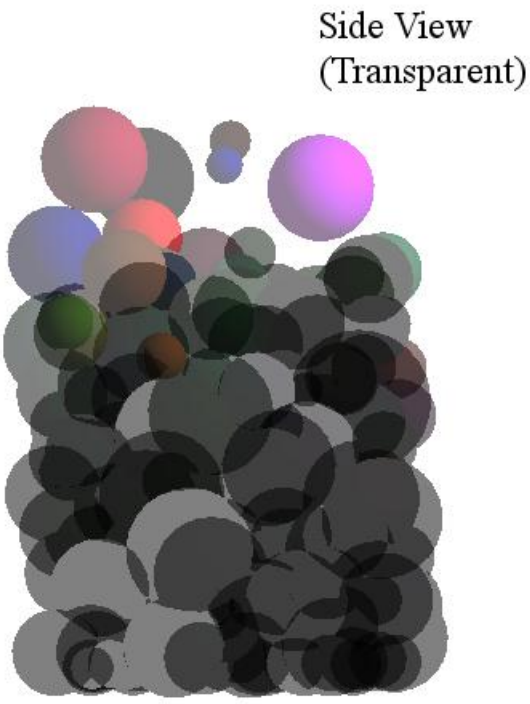

Fig. 6

Visual Explanation

Figures 4-6 show the velocity of particles as they collide and become denser in some sort of fluid. The colored spheres show particles with more velocity in some direction. Red represents X-velocity, green represents Y-velocity, and blue represents Z-velocity. I proved my hypothesis by showing that the particles that have the greatest velocity are the ones that aren't as densely packed and the densely packed particles have little to no velocity. The way I programmed the colors, if there are velocities in more than one direction, they will add to the R,G, or B value which allows the colors to combine. The way to interpret this data is to say that the more *intense* the R, G, or B value, the more acceleration in that direction along the axis. Brighter colors are faster particles. Darker colors are slower particles.

Sources

[1] http://www.syedrezaali.com/blog/?p=807

[2] http://www.syedrezaali.com/blog/?tag=particles

[3] http://www.popsci.com/technology/article/2010-07/video-some-very-impressive-falling-dirt-and-flying-neckties

[4] http://www.tungsten-spheres.com/3d_tungsten_spheres_pack.html