

Joe Forte  
5/13/08

### **Project:** Soft Particles

**Compilation:** Project files are provided for Visual Studio 2008 that have been compiled and tested on Windows XP and Vista. NOTE: If the program is run from visual studio you must set the programs working directory to “\$(SolutionDir)” without quotas. This can be done by going to the project properties, navigating to the ‘Debugging’ category under ‘Configuration Properties’ and filling in the ‘Working Directory’ field.

**Dependencies:** The following libraries are needed by the Soft Particles program

1. SOIL (<http://lonesock.net/soil.html>) – An OpenGL image loading library. Precompiled static libraries have been compiled and are setup in the provided project files.
2. GLEW – OpenGL extension library. The dynamic library for GLEW has been precompiled and setup in the provided project files.
3. OpenGL and GLUT – Assumed to be installed on the target machine. The program requires the target machine to have a graphics card that supports OpenGL 2.0 and the GL\_ARB\_color\_buffer\_float extension. The program has been run on an NVidia 8800 and an NVidia 8600.

### **About:**

The Soft Particle program provides three particle systems that can be rendered with and without the soft particle technique. The program is interactive and runs in real time reaching a constant 60 frames per second on a mobile 8600 with ~300 particles.

### **Soft Particle Method:**

The Soft particle method works in two main passes:

1. In the first pass the scene is rendered (without particles). In the process of rendering the scene, depth information is saved to a texture. In the case of this application, the OpenGL frame buffer object extension is used to attach a texture to the end of the graphics pipeline where depth information is saved.
2. In the second pass the particles are rendered. The depth information computed in the first pass is used as a texture when rendering the particles. The pixel shader used in this pass computes the distance in depth between the current pixel being rendered and the corresponding pixel from the scene depth. This distance is passed into a function that returns an alpha value between 0 and 1 that is then set as the final alpha value for

the pixel being rendered. The program allows for the power of this function to be changed at run time.

### **Program Controls:**

Key:	Description:
ESC	Exits the program
Left mouse button	When held down the mouse rotates the view
Right mouse button	When held down the mouse will zoom the view in and out
Middle mouse button	When held down the mouse will pan the view on the xz plane
'w', 'a', 's', 'd'	Rotates the view up, down, left and right
'z', 'x'	Zooms the view in and out
'r'	Resets the camera to its default position
'i'	Turns the information display on and off
'p'	Pauses the particle simulation
'o'	Outputs a screenshot
'1'	Enables the Fountain particle system
'2'	Enables the Smoke Cloud particle system
'3'	Enables the Smoke Stack particle system
'v'	Turns wind on and off
'+', '-'	Increases and decreases the particle spawn rate
'<', '>'	Increases and decreases the power used with soft particles
'f'	Turns soft particle rendering on and off

### **Files:**

1. \SoftParticles\\* - Folder containing the C++ source files for the Soft Particles program.
2. \Data\\* - Folder containing the texture data, vertex shaders and pixel shaders needed by the soft particle program.

3. \lib\\* - Contains precompiled library files for SOIL and GLEW. NOTE: Only needed for compiling.
4. \GLEW\\* - Folder containing headers for using the GLEW library.
5. \SOIL\\* - Folder containing headers for using the SOIL image loading library.
6. glew32.dll – Precompiled dynamic library for the GLEW library.
7. Fountain.png – A screenshot of the Fountain particle system.
8. SmokeCloud\_without.png – A screenshot of the Smoke Cloud particle system rendered without using the soft particles method.
9. SmokeCloud\_with.png – A screenshot of the Smoke Cloud particle system rendered using the soft particle technique.
10. SoftParticles.vs9.sln – Visual Studio 2008 solution file.
11. README.pdf – This file.