



User Guide

Cloth



DEVELOPMENT

What Is This?

The sample demonstrates how to use Shader Model 3.0 to simulate and render cloth on the GPU. The cloth vertex positions are computed through several pixel shaders and saved into a texture. A vertex shader then reads these positions using Vertex Texture Fetch (VTF) to render the cloth.

More information can be found in [Cloth.pdf](#)

System Requirements

On a GPU that does not support VS3.0, the sample runs with the Direct3D's reference rasterizer.

Using the Cloth Sample

When you launch the sample, it looks like Figure 1. There are three scenes, each of them featuring a different cloth application: A curtain, a flag, a cape, and a skirt. The curtain, the cape and the skirt are subject to a vertical force (gravity); the flag is subject to a horizontal force field (wind).

You can interact with these pieces of cloth by:

- Selecting vertices and moving them around
- Nailing vertices
- Cutting through the cloth

Cloth collides with the environment, made of collision objects that are planes, spheres, boxes, and ellipsoids. There is also a character used to feature the cape and the skirt. You can interact with all collision objects - except for the walls, floor, ceiling and the character's collision objects - by selecting them and:

- Moving them around
- Scaling them
- Deleting them

You can also add more collision objects.

At the bottom of the screen is a series of menu buttons used to control the sample.

Figure 1: The cloth sample on launch



Controls

Menus are detailed in the tables 1 to 5 below. Some menu items have a key shortcut indicated in parenthesis.

Table 1: Render Menu

Item	Description
Camera center (C)	Centers camera around one of the three scenes
Curtain (J)	Displays the curtain (When the curtain is not displayed, the curtain isn't simulated.)
Flag (K)	Displays the flag (When the flag is not displayed, the flag isn't simulated.)
Cape (L)	Displays the cape (When the cape is not displayed, the cape isn't simulated.)
Skirt (P)	Displays the skirt (When the skirt is not displayed, the cape isn't simulated.)
Character (G)	Displays either the character's model only, its collision objects only, or both
Wireframe (W)	Renders in wireframe the clothes, the environment, both the clothes and the environment, or none of them
Cloth normals (N)	Displays the clothes normals
Collision objects thinning	Controls the value of the thinning of each collision object to avoid z-fighting when clothes are rendered on top of these objects
Toggle full screen (Alt+Enter)	Toggles between full screen and windowed mode

Table 2: Simulate Menu

Item	Description
Run (Space)	Runs or pauses the simulation and character animation

Item	Description
Step (1..9)	Runs the simulation and character animation once (When using one of the key shortcuts, the simulation and character animation are run as many times indicated by the key value.)
Reset (0)	Resets the simulation and character animation
Fixed time step	Sets the simulation time step to be a constant value as opposed to equal to the frame duration
Simulation rate	Sets the simulation rate when the simulation time step is fixed
Cloth selection free (F)	Lets the clothes' selected vertices be free – as opposed to fix - when they aren't moved around with the mouse
Width	Number of quads along the width (This control is per cloth and not available for the skirt.)
Height	Number of quads along the height (This control is per cloth and not available for the skirt.)
Relaxation iterations	Controls the number of times the relaxation is performed during the simulation (This control is per cloth.)
Shear springs	Simulates shear springs (This control is per cloth.)
Gravity strength	Controls the gravity (This control is per cloth, not available for the flag.)
Wind heading	Controls the wind heading (This control is per cloth, available only for the flag.)

Table 3: Edit Menu

Item	Description
Add plane	Adds a plane to the environment
Add sphere	Adds a sphere to the environment
Add box	Adds a box to the environment
Add ellipsoid	Adds an ellipsoid to the environment
Select mode (I)	Enables the select mode allowing you to select objects and select/nail cloth vertices

Item	Description
Unselect all (U)	Unselects selected objects and selected cloth vertices
Remove selection (Del)	Removes selected objects
Scale selection (S)	Sets the mouse configuration to "X-scale selection" for the left button, "Y-scale selection" for the middle button and "Z-scale selection" for the right button
Move selection (A)	Sets the mouse configuration to "Rotate selection" for the left button, "Dolly selection" for the middle button and "Pan selection" for the right button
Move environment only (E)	Ignores cloth selection when moving the selection
Keep rotating (R)	Makes a user-rotated selection keep rotating when the mouse is released
Cut (X)	Sets the mouse configuration to "Cut" for the left button
Uncut (Z)	Stitches back together cloth cuts

Table 4: Mouse Menu

Item	Description
Mouse left drag	Sets the action to be performed when dragging the mouse with the left button
Mouse middle drag	Sets the action to be performed when dragging the mouse with the middle button
Mouse right drag	Sets the action to be performed when dragging the mouse with the right button
Mouse left click	Sets the action to be performed when clicking the mouse left button
Mouse right click	Sets the action to be performed when clicking the mouse right button
Default settings (D)	Sets the mouse configuration to "Rotate camera" for the left button, "Dolly selection" for the middle button and "Pan selection" for the right button

Table 5: Device Menu

Item	Description
Toggle REF (F3)	Toggles between HAL and reference device
Change device (F2)	Shows the device dialog

In addition to the menu shortcut keys, there are other key controls described in Table 6.

Table 6: Other Key Controls

Key	Description
F1	Displays a description of the key controls of Table 6
H	Displays or hides the user interface
M	Opens or closes all the menus
Left drag	Each menu can be dragged around to any other location on the screen.
Hold Ctrl	When holding the Ctrl key, the mouse configuration is set to the default configuration. This allows you, for example, to temporarily control the camera with the left mouse button when the left mouse button is set to another action.
Hold Shift	Sets the mouse configuration to "Rotate selection" for every mouse button that is set to "Pan selection" and vice-versa. This allows you to easily switch from rotating to panning the selection while using the same mouse button.
ESC	Quits the sample



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