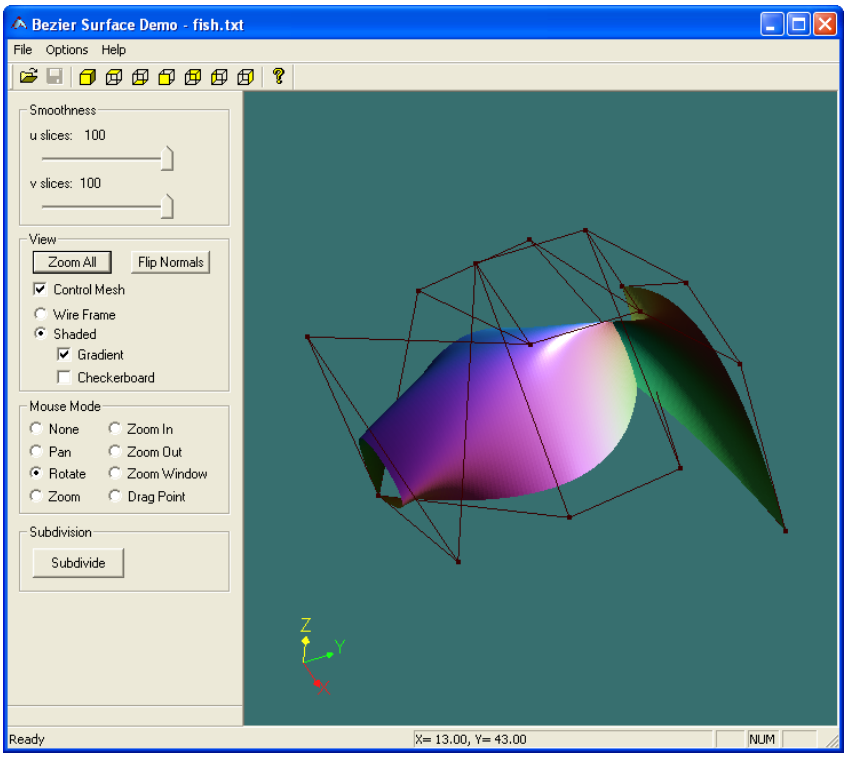
Bezier Surface Patch Demo Manual

— *An interactive teaching tool for Bezier surface patch*



Wei Li

liweitshu@gmail.com

PhD Student,

Mechanical Engineering, UC Berkeley

2006/12

System Requirements

This program can only run on Windows OS. OpenGL supports and a screen resolution of at least 800×600 are required.

Data File Format

User should provide a text file of control points with a specific format. Suppose you have a $m \times n$ control mesh. The first two rows of the data file are *m* and *n* respectively. From the third row, each row lists the *x*, *y* and *z* coordinates of a control point. Control points are ordered from top to bottom and then from left to right. Coordinates can be separated by whitespace, comma, semicolon or tab. Blank lines are allowed. The table illustrates the file format.

File Content	Description
m	number of rows
n	number of columns
x y z	coordinates of the point at row 1, column 1
x y z	coordinates of the point at row 1, column 2
…	…
x y z	coordinates of the point at row 1, column n
x y z	coordinates of the point at row 2, column 1
…	…
x y z	coordinates of the point at row 2, column n
…	…
x y z	coordinates of the point at row m, column n

Below is an example data file of 4×4 control mesh.

bowl.txt

```
4
4

-1.5 -1.5 -1.0
-1.5 -0.5 0.0
-1.5 0.5   0.0
-1.5 1.5   -1.0

-0.5 -1.5 0.0
-0.5 -0.5 1.0
-0.5 0.5   1.0
```

```
-0.5  1.5   0.0

0.5   -1.5  0.0
0.5   -0.5  1.0
0.5   0.5   1.0
0.5   1.5   0.0
1.5  -1.5   -1.0
1.5   -0.5  0.0
1.5   0.5   0.0
1.5   1.5   -1.0
```

Panel Commands

Smoothness
The smoothness of the surface is controlled by two parameters, *u_slices* and *v_slices*. Each defines the number of slices used to draw the surface in one direction. Default value is 30.

Zoom All
Fit the whole surface in the view.

Flip Normals
Flip the normal of the surface. Used to lighten different sides of the surface.

Control Mesh
Turn on/off the visibility of the control mesh.

Wire Frame
Display the surface in wireframe mode.

Shaded
Display the surface in shaded mode.

Gradient
Color the surface by the local tangency.

Checkerboard
Fill the surface with checkerboard.

Mouse Mode
Define the behavior when click and/or drag the mouse in the view.

None: no behavior
Pan: move the view
Rotate: rotate the view

Zoom: zoom in (drag upward) or out (drag downward) the view

Zoom In: zoom in the view

Zoom Out: zoom out the view

Zoom Window: Zoom the view to a specified window

Drag Point: click on a control point and then drag to move it. Only applicable when the control mesh is turned on. it's a good practice to switch to a 2D view (by clicking icons in the toolbar) before drag points. When you drag a point, the current 3D coordinates will be displayed in the status bar. If you press the SHIFT key when drag the control point, it will be snapped to an existing one.

Subdivide

Subdivide the surface at the point of parameter value (0.5, 0.5) into four subpatches.

Gap: Adjust the gap between the four subpatches.

Unsubdivide

Unsubdivide the surface. Merge the four subpatches into the original patch.

Menu Commands

File -> Open

Open a data file of control points.

File -> Close

Close the current data file.

File -> Save

Save the current data file. Only enabled after the surface is modified by moving control points.

File -> Save As

Save the current data file as another file.

File -> Export Surface as STL

Export the current surface as a binary STL file. "*u_slices*", "*v_slices*" and "*flip normals*" affect the output STL file.

File -> Load Basis Functions

Load the basis functions for Bezier surface patch with different degrees, and display it in 3D space.

File -> Save Subdivision Surfaces

Save the four subpatches of subdivision into four separate data files. Only enabled if the surface is subdivided.

Options -> Color

Change the color of **Background**, **Surface**, **Control Mesh**, and **Basis Functions**. Use **Reset All** to restore the default colors.

Shortcut Keys

Home: Rotate CCW in current view
Page Up: Rotate CW in current view
End: Zoom In
Page Down: Zoom Out
Delete: Switch to *x*-*y* plane
Up Arrow: Move upward
Down Arrow: Move downward
Left Arrow: Move left
Right Arrow: Move right
Middle Mouse Button: roll for zooming, and drag for rotating