SLang - the Next Generation

Tutorial

Christian Bucher, Sebastian Wolff
Center of Mechanics and Structural Dynamics
Vienna University of Technology

November 8, 2010

0.1 Interpolation and visualization of surfaces

This example shows how to interpolate and visualize a surface. The definition of the surface is based on 6 points located arbitrarily in the $x-y$-plane. The z-values are interpolated between these points using a radial basis function interpolation. Specifically, thin plate splines are used in *SLangTNG*. The procedure is shown in the code listing below.

```
--[[
SLangTNG
Simple test example for interpolation and visualization of functions
(c) 2009 Christian Bucher, CMSD-VUT
--]]

-- Create a few points in 3D
  C=tmath.Matrix(6,3)
  tmath.Read(C,
    0,0,1,
    1,0,1,
    0,1,1,
    1,1,1,
    .65, .65, 2,
    .25, .25, -1
    )

-- Interpolate the z-values over a range of x and y with 50x50 points
-- This uses a radial basis function (thin plate spline)
  xmin=0
  xmax=1
  ymin=0
  ymax=1
  tps = stoch.TPS(C:Transpose())
  D=tps:Raster(xmin, xmax, 50, ymin, ymax, 50)

  alpha = 50
  beta = 40

-- Plot this resulting smooth surface
  vis=tnggraphics.TNGVisualize(30, 30, 800, 800, "Surface Plot")
  vis:Perspective(true)
  vis:Edges(false)
  vis:Axes(true)
  vis:Frame(true)
  vis:Lighting(true)
  vis:SetLabels("Surface","x-Axis", "y-Axis", "z-Axis")
  vis:SetAngles(alpha, beta, 0)
  vis:SPlot(D, xmin, xmax, ymin, ymax, 7)
  vis:File("Surface.pdf")

  control.Interactive(true)

-- Rotate plot somewhat
  for k=0,60 do
    vis:SetAngles(alpha, beta - 3*k, 6*k)
    control.Delay(0.03)
    end

-- Do it again and generate single frames for animation
-- Remove block comment to activate
--[[
  TNG.System("rm -rf Movie; mkdir Movie")
  for k=0,60 do
    vis:SetAngles(alpha, beta - 3*k, 6*k)
    vis:File("Movie/Frame"..1000+k.."".png")
    end
--]]

-- Generate a matrix containing the interpolation at a
-- finer resolution of 400x400
  E=tps:Raster(xmin, xmax, 800, ymin, ymax, 800)

-- Write this directly to a pixel image
  tmath.Image(E, "E.png")
```

The resulting surface plot ish shown in Fig. **??**. A matrix containing a finer resolution rasterization using

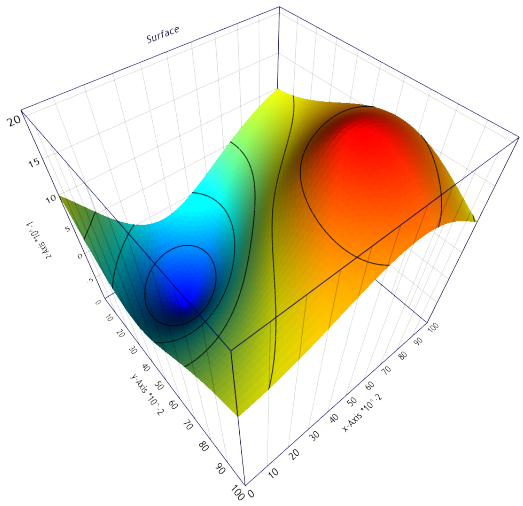

Figure 1: Surface plot generated *SLangTNG*

400x400 points is then written directly to an image file in PNG format. This file is shown in Fig. **??**.

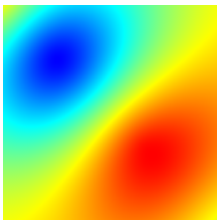

Figure 2: Image file generated directly from matrix data