**נספח**

התוכנית הבאה מבצעת spline ריבועי על sin(x). כפי שאנחנו רואים הדיוק הוא של 2-3 ספרות משמעותיות בלבד, אבל זה לא כל כך רע על פולינום בדרגה כה נמוכה. בהחלט מדגימה את הפוטנציאל של spline.

/\* spline4.java - implement spline interpolation

on the runge function \*/

class Point

{

double x;

double fx;

} // Point

class Function

{

static double f( double x)

{

return 1.0/(1.0+25.0\*x\*x);

} /\* f \*/

} // Function

class Si\_rec

{

int n; /\* no\_of\_points \*/

Point point\_arr[];

double z[];

} // Si\_rec

public class spline4

{

static void compute\_z(Si\_rec si\_r, double z0)

{

double zi, t;

int i;

si\_r.z[0] = z0;

zi = z0;

for(i=1; i <= si\_r.n; i++)

{

t = 2\*(si\_r.point\_arr[i].fx - si\_r.point\_arr[i-1].fx);

t = t/(si\_r.point\_arr[i].x -si\_r.point\_arr[i-1].x);

zi = -zi + t;

si\_r.z[i] = zi;

} //for

} /\* compute\_z \*/

static double interpolate(Si\_rec si\_r, double x)

{

int i, j, n;

double t1, t2, a, b, c;

n = si\_r.n;

for(i=0; i < n; i++)

if (x >= si\_r.point\_arr[i].x && x < si\_r.point\_arr[i+1].x)

break;

b = si\_r.z[i];

c = si\_r.point\_arr[i].fx;

a = si\_r.z[i+1] - si\_r.z[i];

a = a/(2\*(si\_r.point\_arr[i+1].x - si\_r.point\_arr[i].x));

t1 = x - si\_r.point\_arr[i].x;

t2 = c + b\*t1 + a\*t1\*t1;

return t2;

} /\* interpolate \*/

static void compute\_runge\_nodes(int n, double runge\_nodes[])

{

int i;

for (i=1; i <= n+1; i++)

runge\_nodes[i-1] = -1 + (i-1)\*2.0/( double)n;

} // compute\_runge\_nodes

static public void main(String args[])

{

int i, n;

Si\_rec si\_r = new Si\_rec();

double x;

double runge\_nodes[];

n = 8;

si\_r.n = n-1;

si\_r.point\_arr = new Point[n];

for(i=0; i < n; i++)

si\_r.point\_arr[i] = new Point();

si\_r.z = new double [n];

runge\_nodes = new double [n];

compute\_runge\_nodes(n-1, runge\_nodes);

for(i=0; i < n; i++)

{

si\_r.point\_arr[i].x = runge\_nodes[i];

si\_r.point\_arr[i].fx = Function.f(runge\_nodes[i]);

} /\* for \*/

compute\_z(si\_r, 0.0);

x = -0.9;

System.out.println("x = " + x + ", real value = " +

Function.f(x) + ", interpolation = " +

interpolate(si\_r, x));

x =runge\_nodes[2];

System.out.println("x = " + x + ", real value = " +

Function.f(x) + ", interpolation = " +

interpolate(si\_r, x));

x = -0.5;

System.out.println("x = " + x + ", real value = " +

Function.f(x) + ", interpolation = " +

interpolate(si\_r, x));

x = -0.3;

System.out.println("x = " + x + ", real value = " +

Function.f(x) + ", interpolation = " +

interpolate(si\_r, x));

x = runge\_nodes[3];

System.out.println("x = " + x + ", real value = " +

Function.f(x) + ", interpolation = " +

interpolate(si\_r, x));

x = runge\_nodes[4];

System.out.println("x = " + x + ", real value = " +

Function.f(x) + ", interpolation = " +

interpolate(si\_r, x));

x = 0.3;

System.out.println("x = " + x + ", real value = " +

Function.f(x) + ", interpolation = " +

interpolate(si\_r, x));

x = 0.5;

System.out.println("x = " + x + ", real value = " +

Function.f(x) + ", interpolation = " +

interpolate(si\_r, x));

x = runge\_nodes[6];

System.out.println("x = " + x + ", real value = " +

Function.f(x) + ", interpolation = " +

interpolate(si\_r, x));

x = 0.9;

System.out.println("x = " + x + ", real value = " +

Function.f(x) + ", interpolation = " +

interpolate(si\_r, x));

} /\* main \*/

} // spline4

פלט ריצה:

x = -0.9, real value = 0.047058823529411764, interpolation = 0.04265578635014837

x = -0.4285714285714286, real value = 0.17883211678832114, interpolation = 0.17883211678832114

x = -0.5, real value = 0.13793103448275862, interpolation = 0.14523897986827658

x = -0.3, real value = 0.3076923076923077, interpolation = 0.3122935165566585

x = -0.1428571428571429, real value = 0.6621621621621621, interpolation = 0.6621621621621621

x = 0.1428571428571428, real value = 0.6621621621621624, interpolation = 0.6621621621621624

x = 0.3, real value = 0.3076923076923077, interpolation = 0.3122935165566587

x = 0.5, real value = 0.13793103448275862, interpolation = 0.14523897986827644

x = 0.7142857142857142, real value = 0.07270029673590507, interpolation = 0.07270029673590507

x = 0.9, real value = 0.047058823529411764, interpolation = 0.04265578635014856