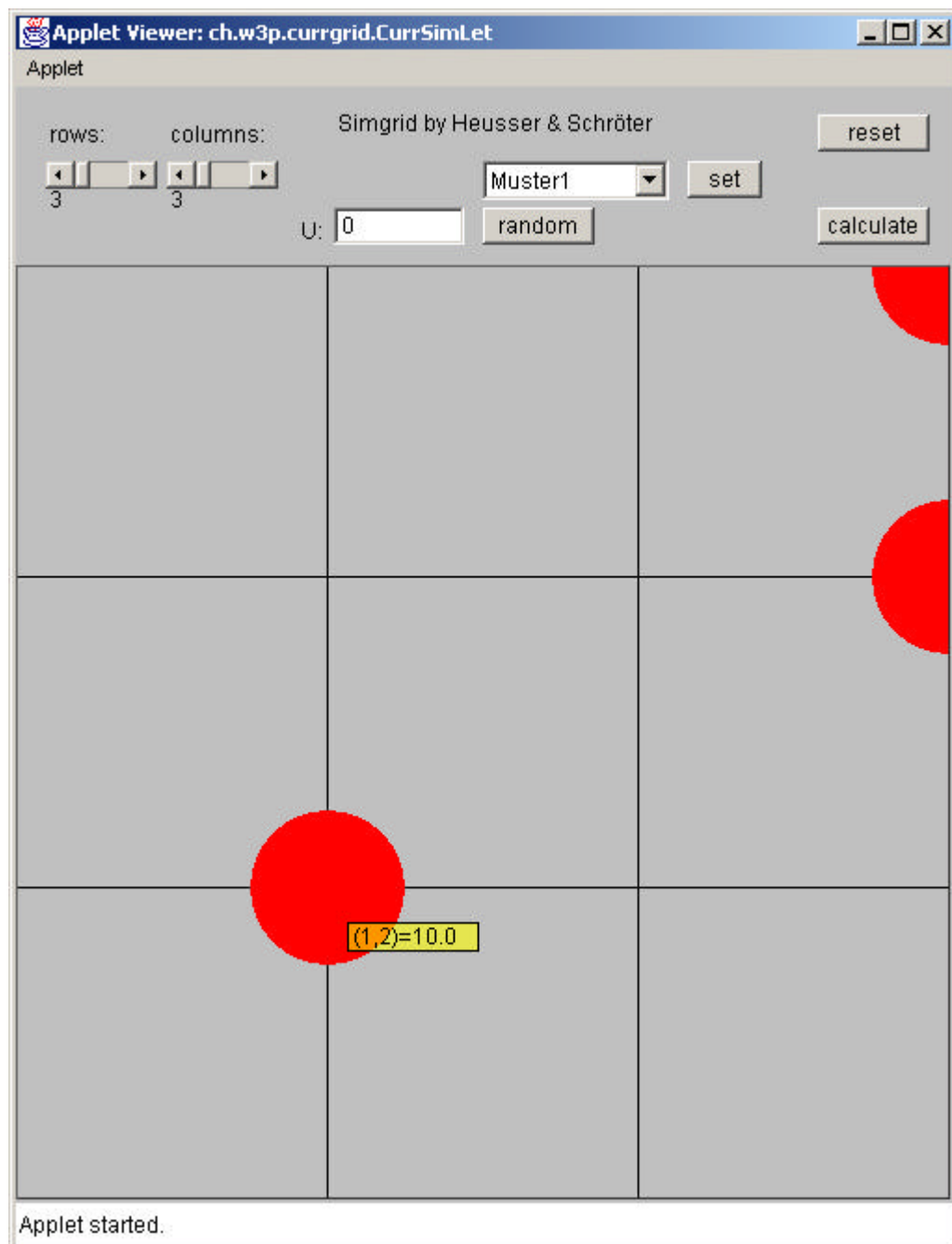
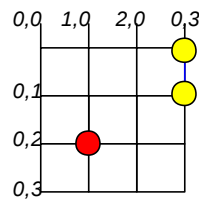


Kontrolle des Programms

Die Kontrolle nimmt Bezug auf das bei der Evaluaton der math. Funktionen verwendete Gitter.

Gelb = 0V
Rot = 10V



Die Matrix wurde wie vorangehend beschrieben von Hand assembliert.

U0;0	U1;0	U2;0	U0;1	U1;1	U2;1	U0;2	U2;2	U3;2	U0;3	U1;3	U2;3	U3;3	x	C
-2	1	0	1	0	0	0	0	0	0	0	0	0	0	0
1	-3	1	0	1	0	0	0	0	0	0	0	0	0	0
0	1	-3	0	0	1	0	0	0	0	0	0	0	0	0.0
1	0	0	-3	1	0	1	0	0	0	0	0	0	0	0
0	1	0	1	-4	1	0	0	0	0	0	0	0	0	-10
0	0	1	0	1	-4	0	1	0	0	0	0	0	0	0.0
0	0	0	1	0	0	-3	0	0	1	0	0	0	0	-10
0	0	0	0	0	1	0	-4	1	0	0	1	0	0	-10
0	0	0	0	0	0	0	1	-3	0	0	0	1	0	0.0
0	0	0	0	0	0	1	0	0	-2	1	0	0	0	0
0	0	0	0	0	0	0	0	0	1	-3	1	0	0	-10
0	0	0	0	0	0	0	1	0	0	1	-3	1	0	0
0	0	0	0	0	0	0	0	1	0	0	1	-2	0	0

Dann folgt der Vergleich mit der vom Programm generierten. Resultat: sie stimmen überein!

0	1	2	3	4	5	6	7	8	9	10	11	12	x	C
-2.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.0	-3.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	1.0	-3.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.0	0.0	0.0	-3.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	1.0	0.0	1.0	-4.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-10.0
0.0	0.0	1.0	0.0	1.0	-4.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	1.0	0.0	0.0	-3.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	-10.0
0.0	0.0	0.0	0.0	0.0	1.0	0.0	-4.0	1.0	0.0	0.0	1.0	0.0	0.0	-10.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	-3.0	0.0	0.0	0.0	1.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	-2.0	1.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	-3.0	1.0	0.0	0.0	-10.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	1.0	-3.0	1.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	1.0	-2.0	0.0	0.0

Mit folgendem Befehl wurde die Matrix in Maple generiert

```
> with(linalg);
> A := matrix(13, 15, [-2,1,0,1,0,0,0,0,0,0,0,0,0,0,1, -
3,1,0,1,0,0,0,0,0,0,0,0,0,0,0,1, -
3,0,0,1,0,0,0,0,0,0,0,0,0,0,1,0,0, -
3,1,0,1,0,0,0,0,0,0,0,0,0,0,1,0,1, -4,1,0,1,0,0,0,0,0,0, -
10,0,0,1,0,1, -4,0,1,0,0,0,0,0,0,0,0,0,1,0,0, -
3,0,0,1,0,0,0,0, -10,0,0,0,0,0,1,0, -4,1,0,0,1,0,0, -
```

```
10,0,0,0,0,0,0,0,1,-3,0,0,0,1,0,0,0,0,0,0,0,0,1,0,0,-  
2,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,-3,1,0,0,-  
10,0,0,0,0,0,0,0,1,0,0,1,-3,1,0,0,0,0,0,0,0,0,0,0,1,0,0,1,-  
2,0,0]);
```

Dies führt zur folgenden Ausgabe von Maple:

```

A:=
-2  1  0  1  0  0  0  0  0  0  0  0  0  0  0
 1 -3  1  0  1  0  0  0  0  0  0  0  0  0  0
 0  1 -3  0  0  1  0  0  0  0  0  0  0  0  0
 1  0  0 -3  1  0  1  0  0  0  0  0  0  0  0
 0  1  0  1 -4  1  0  1  0  0  0  0  0  0 -10
 0  0  1  0  1 -4  0  1  0  0  0  0  0  0  0
 0  0  0  1  0  0 -3  0  0  1  0  0  0  0 -10
 0  0  0  0  0  1  0 -4  1  0  0  1  0  0 -10
 0  0  0  0  0  0  0  1 -3  0  0  0  1  0  0
 0  0  0  0  0  0  1  0  0 -2  1  0  0  0  0
 0  0  0  0  0  0  0  0  0  1 -3  1  0  0 -10
 0  0  0  0  0  0  0  1  0  0  1 -3  1  0  0
 0  0  0  0  0  0  0  0  1  0  0  1 -2  0  0

```

Dieses Array wird nun von Maple mittels Gausselimination gelöst:

```

> gausselim(A);
-2  1  0  1  0  0  0  0  0  0  0  0  0  0  0
 0  1 -3  0  0  1  0  0  0  0  0  0  0  0  0
 0  0  3  1 -4  0  0  1  0  0  0  0  0  0 -10
 0  0  0 -3  3  -1/2  1  -1/2  0  0  0  0  0  0  5
 0  0  0  0 -5  37/18  8/9  31/18  0  0  0  0  0  0 -155/9
 0  0  0  0  0  1  0 -4  1  0  0  1  0  0 -10
 0  0  0  0  0  0  1  0  0 -2  1  0  0  0  0
 0  0  0  0  0  0  0  1 -3  0  0  0  1  0  0
 0  0  0  0  0  0  0  0  3  0  1 -3  0  0  0
 0  0  0  0  0  0  0  0  0  1 -3  1  0  0 -10
 0  0  0  0  0  0  0  0  0  0 -1/3  2  -2  0  0
 0  0  0  0  0  0  0  0  0  0  0  3607/90  -5083/90  0  -274/9
 0  0  0  0  0  0  0  0  0  0  0  0  -61965/3607  0  -331010/3607

```

Wir erhalten wieder eine $Ax=C$ Matrix und können die mit der Vergleichen, die unser Programm berechnet hat.

0	1	2	3	4	5	6	7	8	9	10	11	12	x	C
-2.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.1644333...	0.0
0.0	-2.5	1.0	0.5	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.2598071...	0.0
0.0	0.0	-2.6	0.2	0.4	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0558418...	0.0
0.0	0.0	0.0	-2.384...	1.2307...	0.0769...	1.0	0.0	0.0	0.0	0.0	0.0	0.0	7.0690596...	0.0
0.0	0.0	0.0	2.2204...	-2.903...	1.1935...	0.5161...	0.0	0.0	0.0	0.0	0.0	0.0	6.5591463...	-10.0
0.0	0.0	0.0	1.3877...	0.0	-3.122...	0.2444...	1.0	0.0	0.0	0.0	0.0	0.0	3.9077184...	-4.1111111...
0.0	0.0	0.0	0.0	0.0	-2.775...	-2.4697...	0.0782...	0.0	1.0	0.0	0.0	0.0	8.4835991...	-12.099644...
0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3.677...	1.0	0.031...	0.0	1.0	0.0	6.0158855...	-11.700288...
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.728...	0.008...	0.0	0.271...	1.0	3.6979324...	-3.1818181...
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.594...	1.0	0.009...	0.00...	8.3817377...	-5.0100545...
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.372...	1.005...	0.00...	8.2798763...	-13.141493...
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.274...	1.10...	6.4578912...	-9.0997077...
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.336...	0.0	0.0	-1.10...	5.0779118...	-5.5903212...

Die Kontrolle zeigt, dass unser Programm exakt die gleiche Matrix erhält, wie wenn ich das Gitter von Hand in eine $Ax=C$ Matrix umforme und mit Maple berechne.

Test geglückt!

Und so sieht das Ausgabebild dieses Tests aus:

