

Trabajo Práctico Nro 2

Métodos Numéricos - 2019

Grupo 1:

Mestanza Joaquín

Müller Malena

Nowik Ariel

Regueira Marcelo

Reller Thomas

June 6, 2019

1 INTRODUCCIÓN

2 IMPLEMENTACIÓN

```
1 function [x t]=heun(f,x0,t0,tf,n,par)
2     h=(tf-t0)/n;
3     t=linspace(t0,tf,n);
4     x(1,:)=x0;
5     for i=1:n-1
6         k1(i,:)=f(t(i),x(i,:),par);
7         k2(i,:)=f(t(i)+h,x(i,:)+k1(i,:),par);
8         x(i+1,:)=x(i,:)+(h/2)*(k1(i,:)+k2(i,:));
9     end
```

Listing 1: heun.m

```
1 function [x t]=miode(f,x0,t0,tf,dtmax,tol,par)
2     n = ceil((tf-t0)/dtmax);
3     err = 1;
4
5     while (err > tol)
6         [x1 t1] = heun(f,x0,t0,tf,n,par);
7         [x2 t2] = heun(f,x0,t0,tf,n*2,par);
8         err = max(abs(x1(tf)-x2(tf)));
9         n = n + 1;
10    end
11
12    [x t] = heun(f,x0,t0,tf,n-1,par);
```

Listing 2: miode.m

```
1 f=@(t,y,p) 2*t;
2
3 [x t] = miode(f, 1, -2, 2, 1, 10^-1,'a');
4
5 plot(t,x)
```

Listing 3: ejemplo.m

```
1 clear all;
2 clc;
3
4 I_R=@(t,p) strcmp(p,'a3')*(0.0001).*(20<=t && t<=80)+strcmp(p,'b3')*(-0.00012).*(20<=t && t<=80);
5
6 I_B=@(t,p) strcmp(p,'a1')*(0.0001).*(20<=t && t<=80)+strcmp(p,'b1')*(-8.3*10^-5).*(20<=t && t<=80);
7
8 I_C=@(t,p) strcmp(p,'a2')*(0.0001).*(20<=t && t<=80)+strcmp(p,'b2')*(-0.00029).*(20<=t && t<=80);
9
10 I_P=@(t,p) strcmp(p,'c1')*(1000).*(20<=t && t<=80);
11
12 I_0=@(t,p) strcmp(p,'c2')*(2.5*10^5).*(20<=t && t<=80);
13
14 I_L=@(t,p) strcmp(p,'c3')*(10^4).*(t>=20);
15
16 % constantes
17 k1 = 10^(-2);
```

```

18 k2 = 10;
19 f0 = 0.05;
20 d_B = 0.7;
21 Cs = 5*10^(-3);
22 k3 = 5.8 * 10^(-4);
23 k4 = 1.7 * 10^(-2);
24 k0 = 0.35;
25 K = 10;
26 klp = 3*10^6;
27 kop = 2*10^5;
28 r_L = 10^3;
29 k_P = 86;
30 S_P = 250;
31 k6 = 3;
32 k5 = 0.02;
33
34 P0 = S_P / k_P;
35 Ps = k6 / k5;
36
37 D_R = 7*10^(-4);
38 D_B = f0 * d_B;
39 k_B = 0.189;
40 D_C = 2.1*10^(-3);
41 D_A = 0.7;
42 R = 0.0007734;
43 B = 0.0007282;
44 C = 0.0009127;
45
46 pi_C = @(t,y,p) (y(3) + f0 * Cs)/(y(3) + Cs);
47 P_ = @(t,p) I_P(t,p) / k_P;
48 pi_p = @(t,p) (P_(t,p) + P0)/(P_(t,p) + Ps);
49 pi_L = @(t,y,p) (k3/k4)*((klp * pi_p(t,p) * y(2))/(1 + (k3*K/k4) + (k1/(k2*k0))*((kop/pi_p(t,p))*y
    (1) + I_0(t,p) ))) * (1 + (I_L(t,p)/r_L));
50
51
52 f=@(t,y,p) [
53     D_R*pi_C(t,y,p)-(D_B/pi_C(t,y,p))*y(1)+I_R(t,p),D_B/pi_C(t,y,p)*y(1)-k_B*y(2)+I_B(t,p),D_C*pi_L(t
    ,y,p)-D_A*pi_C(t,y,p)*y(3)+I_C(t,p)
54 ];
55
56
57 [x t] = miode(f, [R B C], 0, 140, 1, 10^-6,'a1');
58 plot(t, x)
59 [x t] = miode(f, [R B C], 0, 140, 1, 10^-6,'a2');
60 plot(t,x)
61 [x t] = miode(f, [R B C], 0, 140, 1, 10^-6,'a3');
62 plot(t,x)
63 [x t] = miode(f, [R B C], 0, 140, 1, 10^-6,'b1');
64 plot(t,x)
65 [x t] = miode(f, [R B C], 0, 140, 1, 10^-6,'b2');
66 plot(t,x)
67 [x t] = miode(f, [R B C], 0, 140, 1, 10^-6,'b3');
68 plot(t,x)
69 [x t] = miode(f, [R B C], 0, 140, 1, 10^-6,'c1');
70 plot(t,x)

```

```

71 [x t] = miode(f, [R B C], 0, 140, 1, 10^-6, 'c2');
72 plot(t,x)
73 [x t] = miode(f, [R B C], 0, 140, 1, 10^-6, 'c3');
74 plot(t,x)

```

Listing 4: edos.m

3 RESULTADOS

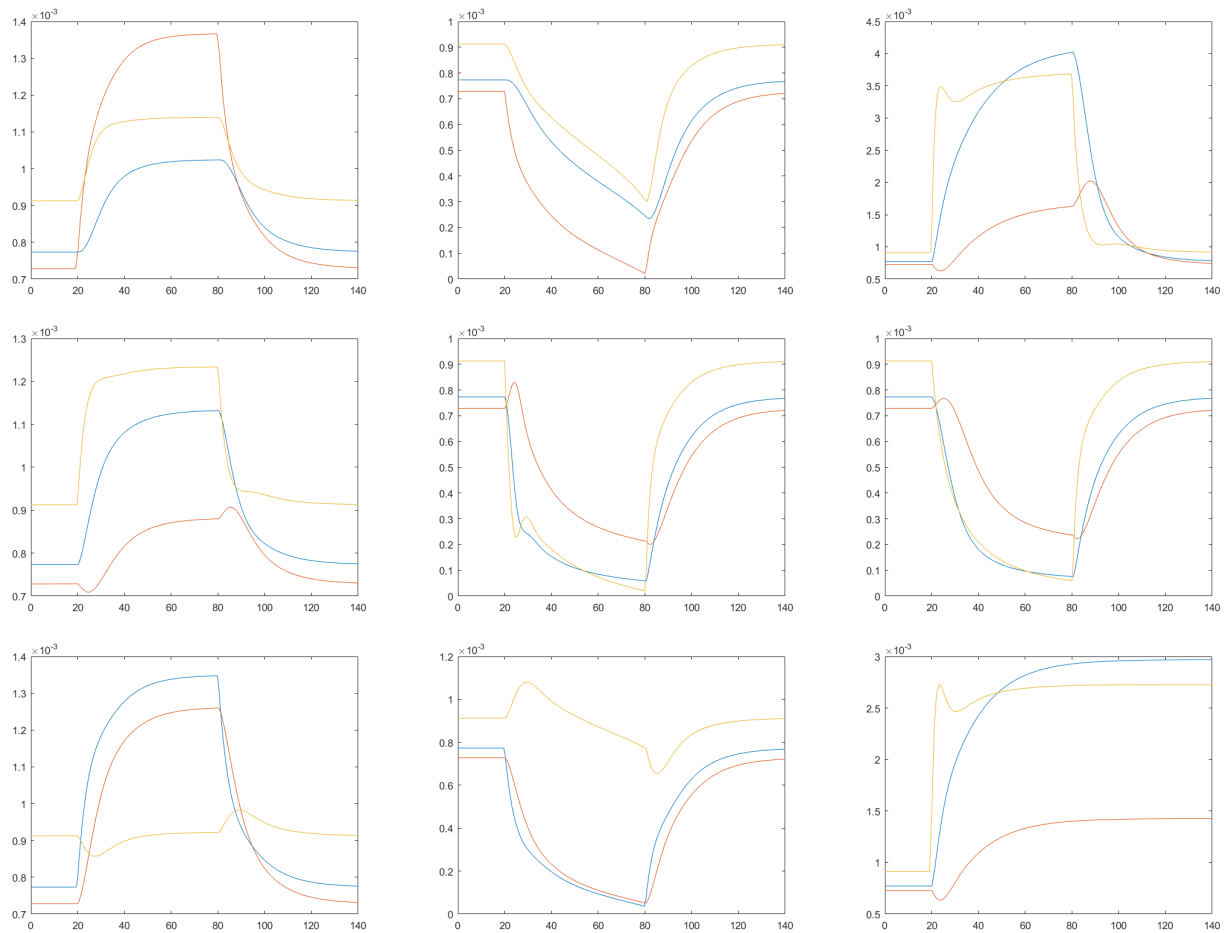


Figure 3.1: Resultados de las EDOs.