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// T14simCat.sce
// SIMULATION OF DISCRETE MODEL
// (multinomial model - controlled coin with memmory)
//      f( y(t) | u(t),y(t-1) ),  y,u=1,2
// Experiments
// - set the parameters to obtain a deterministic model
// - try to extend the model to f(y(t)|u(t),y(t-1),u(t-1))
//   and values 1,2,3.
// -----
exec("ScIntro.sce",-1), mode(0)

nd=500;                // number of steps           // 1
// PARAMETERS          // 2
//y(t)=1 =2 // u(t) y(t-1)           // 3
// -----           // 4
// u(t)    1  1  2  2           // model           // 5
// y(t-1)  1  2  1  2           // 6
thS=      [.2 .6 .9 .7 // y(t)=1     // 7
           .8 .4 .1 .3]; // y(t)=2         // 8
y(1)=1; u(1)=0;        // initial conditions // 9
S=zeros(2,4);         // initial statistics // 10
// 11
// TIME LOOP          // 12

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for t=2:nd // 13
    // simulation // 14
    u(t)=sum(cumsum([.3 .7])<rand(1,1,'u'))+1; // control // 15
    k=2*(u(t)-1)+y(t-1); // column in the model // 16
    y(t)=sum(cumsum(thS(:,k))<rand(1,1,'u'))+1;// output // 17
    // estimation // 18
    S(y(t),k)=S(y(t),k)+1; // 19
end // 20
thE=fnorm(S,1); // 21
// 22
// RESULTS // 23
subplot(211),plot(1:nd,u,'g:.'') // 24
set(gcf(),"position",[700 100 600 500]) // 25
title('Input') // 26
set(gca(),'data_bounds',[0 nd+1 .9 2.1]) // 27
subplot(212),plot(1:nd,y,'b:.'') // 28
title('Output') // 29
set(gca(),'data_bounds',[0 nd+1 .9 2.1]) // 30
// 31
disp('Model parameters',thS) // 32
disp('Estimat od model parameters',thE) // 33

```

Description of the program

- Rows 3–8 set parameters of the model
- Row 9 sets the initial conditions
- Row 10 sets initial statistics (no prior information)
- Rows 13–21 perform the time loop
 - 15: generation of input
 - 26–17: simulation form categorical model
 - 19: update of statistics
- Row 21 performs point estimates of parameters