Identificarea Sistemelor

LABORATOR 1

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PROBLEMA 1

Am inceput laboratorul prin declararea datelor necesare pentru y si u.

```
%DECLARARE DATE

ny = 2; %numarul de iesiri
nu = 3; %numarul de intrari
nr_esantioane = 200; %numarul de esantioane
index = (1:nr_esantioane)'; %momente de esantionare

date_y = randn(nr_esantioane,ny); %date pe canalele de masura de
iesire
y = [index, date_y]; %datele finale de iesire

date_u = randn(nr_esantioane,nu); %date pe canalele de masura de
intrare
u = [index, date_u]; %datele finale de intrare
```

1.1 Date introduse pentru construirea unui obiect de tip IDDATA folosind functia make_DATA (y).

```
DATA_1 = make_DATA (y); //ny=1;
<MAKE_DATA>:

   * Insert the data name block [ENTER means 'DATA']: Data_1
   * Insert data notes (ENTER means none): Notes
   * Insert the experiment name (ENTER means none): Experiment_1
   * Insert the time unit (ENTER means none): s
   * Insert the starting date in format <dd-mmm-yyyy HH:MM:SS> (ENTER means NOW): 01-01-2024
   * Insert data name on channel 1 (ENTER means none): Acceleratie
   * Insert unit on channel 1 (ENTER means none): m/s^2

<MAKE_DATA>: Data saved in file <Data_1.MAT>.

DATA_1 =

Experiment Experiment_1. Time domain data set with 200 samples.
Sample time: 1 seconds
Name: Data_1

Outputs            Unit (if specified)
   Acceleratie        m/s^2
```

Fig 1.1.

1.2 Date introduse pentru construirea unui obiect de tip IDDATA folosind functia make_DATA_modificat (y,u) cu o intrare si o iesire.

```
DATA_2 = make_DATA_modificat (y, u); //ny=nu=1;
```

```
<MAKE_DATA>:

   * Insert the data name block [ENTER means 'DATA']: Data_2
   * Insert data notes (ENTER means none): Notes
   * Insert the experiment name (ENTER means none): Experiment_2
   * Insert the time unit (ENTER means none): s
   * Insert the starting date in format <dd-mmm-yyyy HH:MM:SS> (ENTER means NOW): 01-01-2024
   * Insert data name on channel - OUTPUT 1 (ENTER means none): Acceleratie
   * Insert unit on channel - OUTPUT 1 (ENTER means none): m/s^2
   * Insert data name on channel - INPUT 1 (ENTER means none): Viteza
   * Insert unit on channel - INPUT 1 (ENTER means none): m/s

<MAKE_DATA>: Data saved in file <Data_2.MAT>.
```

```
DATA_2 =

Experiment Experiment_2. Time domain data set with 200 samples.
Sample time: 1 seconds
Name: Data_2

Outputs            Unit (if specified)
   Acceleratie        m/s^2

Inputs             Unit (if specified)
   Viteza             m/s
```

Fig 1.2.

1.3 Date introduse pentru construirea unui obiect de tip IDDATA folosind functia make_DATA_modificat (y,u), dar cu mai multe intrari si iesiri.

```
DATA_3 = make_DATA_modificat (y, u); //ny=2, nu=3;
```

```
<MAKE_DATA>:

   * Insert the data name block [ENTER means 'DATA']: Data_3
   * Insert data notes (ENTER means none): Notes
   * Insert the experiment name (ENTER means none): Experiment_3
   * Insert the time unit (ENTER means none): s
   * Insert the starting date in format <dd-mmm-yyyy HH:MM:SS> (ENTER means NOW):
   * Insert data name on channel - OUTPUT 1 (ENTER means none): o1
   * Insert unit on channel - OUTPUT 1 (ENTER means none): s
   * Insert data name on channel - OUTPUT 2 (ENTER means none): o2
   * Insert unit on channel - OUTPUT 2 (ENTER means none): m
   * Insert data name on channel - INPUT 1 (ENTER means none): i1
   * Insert unit on channel - INPUT 1 (ENTER means none): kg
   * Insert data name on channel - INPUT 2 (ENTER means none): i2
   * Insert unit on channel - INPUT 2 (ENTER means none): c
   * Insert data name on channel - INPUT 3 (ENTER means none): i3
   * Insert unit on channel - INPUT 3 (ENTER means none): l

<MAKE_DATA>: Data saved in file <Data_3.MAT>.
```

```
DATA_3 =

Experiment Experiment_3. Time domain data set with 200 samples.
Sample time: 1 seconds
Name: Data_3

Outputs            Unit (if specified)
   o1                 s
   o2                 m

Inputs             Unit (if specified)
   i1                 kg
   i2                 c
   i3                 l
```

Fig 1.3.

PROBLEMA 2

Am proiectat rutina **make_IDSS.m**, care contruieste un obiect de tip IDSS.

In urmatorul exemplu am folsit DATA_2 si am redat **reprezentarea pe stare**.

```
Obiect_IDSS = make_IDSS (DATA_2);
```

```
Obiect_IDSS =
  Discrete-time identified state-space model:
    x(t+Ts) = A x(t) + B u(t) + K e(t)
       y(t) = C x(t) + D u(t) + e(t)

  A =
         x1       x2       x3       x4       x5       x6       x7
  x1   -0.811 -0.006841   0.2578   0.4961  0.09496  0.04078 -0.01728
  x2  -0.1285   0.8016  -0.5324 -0.02365 -0.07716  -0.1251  0.09956
  x3  -0.2003   0.3812   0.5085  -0.4528  -0.3763 -0.07108  -0.2172
  x4  0.07073   0.2035   0.3373 -0.07501   0.7566   0.6743  -0.1417
  x5 -0.06164   -0.152 -0.02912  -0.2317   -0.504   0.5673   0.2904
  x6   0.3816   0.1997   0.5062   0.1959  -0.1489  -0.2305   0.1301
  x7 -0.08345   0.1518  0.09659   0.1855  -0.1635   0.3808   0.3799

  B =
         Viteza
  x1  -0.002441
  x2 -0.0001791
  x3   -0.01238
  x4   0.009009
  x5   0.002953
  x6    0.01823
  x7    0.01289

  C =
                  x1      x2      x3      x4      x5      x6       x7
  Acceleratie  1.079  -0.2053  -3.402   5.777  -4.339   3.196 -0.008232

  D =
              Viteza
  Acceleratie      0

  K =
     Acceleratie
  x1    0.009717
  x2    0.008913
  x3   -0.007611
  x4  -0.0001478
  x5     0.00956
  x6    0.004394
  x7   -0.008291

Sample time: 1 seconds
```

Parameterization:
  FREE form (all coefficients in A, B, C free).
  Feedthrough: none
  Disturbance component: estimate
  Number of free coefficients: 70
  Use "idssdata", "getpvec", "getcov" for parameters and their uncertainties.

Status:
Estimated using N4SID on time domain data "Data_2".
Fit to estimation data: 6.88% (prediction focus)
FPE: 1.355, MSE: 1.022