Scilab Identification Toolbox - Existing features

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Contents

Chapter 1

Calling Sequence

```
u = idinput(1024,'PRBS',[0  1/20],[-1  1])
a = [1  0.5];b = [0  2  3];
model = idpoly(a,b,'Ts',0.1)
y = sim(u,model) + rand(length(u),1)
plantData = iddata(y,u,0.1)
sys = armaX(plantData,[2,2,1])
```

Chapter 2

Model structure (idpoly)

2.1 Model structure output

1. Model representation (A,B,C polynomials in increasing power of z^{-1})
2. Sampling time
3. Performance of model - Values of Mean Squared Error(MSE), Final Prediction Error(FPE), Fit Percentage, Raw Akaike's Information Criterion(AIC), Small sample-size corrected (AICc), Normalized AIC(nAIC), Bayesian information criteria(BIC)

2.2 Model structure attributes

1. Polynomial coefficients vector
2. Variable('z^{-1}') used in polynomials
3. Time unit
4. Smpling time
5. Report giving values of MSE, FPE, Fit Percentage, AIC, AICc, AICn, BIC

```
sys  =


 A(z) = 1 + 0.4537984 z^-1 - 0.1279163 z^-2

 B(z) = 1.7062567 z^-1 + 2.6718220 z^-2

 C(z) = 1 + 0.8111934 z^-1

 Sampling Time = 1 seconds

    MSE     FPE    FitPer        AIC     AICc     nAIC        BIC
 0.2436  0.2460  85.0657  1469.8325  86.6306  -1.4025  1494.4899
```

Figure 2.1: Model(idpoly) Output

```
Get(sys)
            a : [1x3 double ]
            b : [1x3 double ]
            c : [1x2 double ]
            d : 1
            f : 1
     Variable : z^-1
     TimeUnit : seconds
           Ts : 1
       Report :
```

Figure 2.2: Model attributes

Chapter 3

Data structure (iddata)

3.1 Data structure output

1. Domain of data : Time (No provision of storing frequency domain data in iddata. Another function 'frd' can store frequency and response data)
2. Number of samples
3. Name of output data vector
4. Name of input data vector
5. Sampling time

Note : No provision of changing name of output or input data vector and time unit.

3.2 Data struture attributes

1. Output data vector
2. Input data vector
3. Sampling time
4. Time unit

```
plantData  =

 Time domain sample data having 1024 samples.
 Sampling Time = 0.100000 seconds

 Output channel
 y1

 Input channel
 u1
```

Figure 3.1: Data(iddata) Output

```
Get(plantData)
      OutputData : [1024x1 double ]
       InputData : [1024x1 double ]
              Ts : 0.10
        TimeUnit : seconds
```

Figure 3.2: Data attributes

Chapter 4

Optimizer

1. diffcode toolbox - Automatic differentiation (consists of functions to evaluate jacobian and hessian but no associated optimizer)
2. Optimbase toolbox - building block for optimization methods(number of variables, minimum and maximum bounds, number of non linear inequality constraints, cost function, logging system, various termination criteria)
3. Nonlinear Least Squares
   (a) lsqrsolve - Levenberg-marquardt algorithm (used in arx, armax, oe)
   (b) leastsq - Non-linear least squares problem
   Algorithms available : quasi-Newton (default), conjugate gradient or non-differentiable
   (c) datafit - Parameter identification based on measured data
   Algorithms available : quasi-Newton (default), conjugate gradient or non-differentiable
4. optim - Non-linear optimization
   Algorithms available : limited memory BFGS algorithm, quasi-Newton method, non-differentiable problems
5. karmarkar - Constrained linear optimization problem
6. neldermead - Direct search optimization algorithms based on the simplex method
7. qpsolve - Quadratic optimization (active set)

8. Ipopt - Interior point method

9. conjgrad - Conjugate gradient solvers