## Lookup table for Toolbox GUI 'RAFD(Jun08)'

1. Max. pattern number: 5.

2. Max. fault number: 3.

3. Start with 'Start.m.

4. Insert all data in GUI.

5. Open 'f\_parameter' under 'fileData.mat' .

Data: Model-based=1, Data-driven =2

Data\_type: Data type I = 1, Data type II = 2, Dynamic process model = 3

Pattern\_Nr: total number of pattern

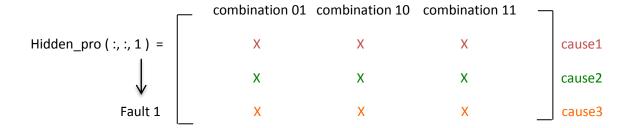
Fault\_ Number: total number of fault

Sample\_Size: calculated sample size N

Fault\_Pattern: to show which fault(s) is(are) chosen for certain pattern

Pattern\_pro: to show probabilities of all patterns

Hidden\_pro: hidden layer for each cause of certain fault



Cause\_Nr: number of cause for certain fault

Fault\_function: to show function(s) which is (are) chosen for each cause

Fault\_range: to show parameters which are set for each cause

Fault\_position: to show on which measurement occurs the fault and type of the fault

	Position	addictive fault	multiplicative fault	
	x	X	Χ	fault 1
Fault_position =	x	X	X	fault 2
	x	X	Χ	fault 3

Covariance : data for covariance matrix

Covariance = [ dimension eigen value(min) eigen value(max) uncertainty\_case]

Detection\_method : detection method for different data type

Detection\_method = [ X X X ]

Data type I: GLR PCA 0 custom

Data type II: PLS CCA LS custom

Dynamic process model: CCA dPCA 0 custom

Estimation\_method : performance evaluation method

FAR FDR

Estimation\_method = [ X X ]

FAR\_estimation (cell) : parameter for FAR performance evaluation

FAR\_estimation {1} = threshold

FAR\_estimation {2} = only with disturbance probability(only with disturbance)
only with uncertainty probability(only with uncertainty)
disturbance and uncertainty probability(disturbance and uncertainty)

Dpmodel: dynamic process model

Samp\_time: sampling time

Sys\_dim: system dimension

<sup>\*</sup>Data-driven : only the first row (without choosing disturbance and uncertainty)

Sys\_matrix (cell): system matrix

Input\_data (cell): information about input signal U

Residual (cell): information about residual and evaluation function

When L is given:Residual {3} = L matrix (3x3)

Uncertainty (cell): information about uncertainty (6 cells for polytopic and 7 cells for parameter uncertainty)

Polytopic uncertainty:

$$A \qquad B \qquad C \qquad E \qquad F \qquad \text{value of L}$$
 Uncertainty  $\{1\} = \{ \qquad X \qquad \}$  Uncertainty  $\{2\} = A \qquad$  Uncertainty  $\{3\} = B \qquad$  Uncertainty  $\{4\} = C$  Uncertainty  $\{5\} = E \qquad$  Uncertainty  $\{6\} = F$ 

Parameter uncertainty:

С Ε F Uncertainty {1} = { X Χ Χ Χ } matrix selection С F Α В Ε Uncertainty {2} = { X Χ Χ } distribution selection Χ Χ \*not chosen =0 \*uniform distribution = 1 \*normal distribution = 2 Uncertainty {3} = A Uncertainty {4} = B Uncertainty {5} = C

 $Fault\_position\_mb\ : to\ show\ whether\ it's\ a\ sensor\ or\ actuator\ fault\ as\ well\ as\ the\ type\ of\ the\ fault$ 

Uncertainty {7} = F

Threshold\_chosen: shows which threshold is used for FD

Uncertainty {6} = E

given threshold threshold ensuring FAR=0

Threshold\_chosen = [ X X ]

## User-customized:

customData.mat -> c\_parameter

## Model-based part :

Name saved in loaded mat. file	*Name saved in program (c_parameter)	Туре	Meaning	*Value saved in 'Choice' (c_parameter	*Represen- tation	*Position
A0, B0, C0, D0, Ed0, Fd0	Process_model	6 elements in a cell structure	Original system matrices	[XX00]	[ load, generate, 0 ]	1.row
Input_signal	Input_signal	1 element in a cell structure	Input signal	[xxxo]	[ load input signal, load disturbance	2.row
Disturbance	Disturbance	1 element in a cell structure	Disturbance signal		signal, generate, 0 ]	
A, B, C, D, Ed, Fd	Poly_uncertainty	6 elements in a cell structure	Polytopic uncertainty matrices	[xxxx]	[ polytopic, parameter, load, generate ]	3.row
L	Filter_gain	1 element in a cell structure	Filter gain matrix	[XX00]	[ load, generate,	4.row
V	Filter	1 element in a cell structure	Filter matrix		0, 0 ]	
			Fault model/ fault data	[xxx0]	[ load fault model, load fault data, generate, 0 ]	5.row

## Fault model / fault data :

Name saved in loaded mat. file	*Name saved in program (c_parameter)	Туре	Meaning
Fault_Pattern	Fault_Pattern	Matrix	
Pattern_pro	Pattern_pro	Matrix	
Hidden_pro	Hidden_pro	Matrix	Detailed explanations and
Fault_Number	Fault_Number	Number	examples see lookup
Pattern_Nr	Pattern_Nr	Number	table above.
Cause_Nr	Cause_Nr	Matrix	
Fault_function	Fault_function	Cell	
Fault_range	Fault_range	Cell	

<sup>\*</sup>For programmer

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