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% reactor_nonlinear_sfcn.m

% -----
% Simulink Function for the Simulation of the Non-linear System
% -----

function [sys, x0, str, ts] = reactor_nonlinear_sfcn(t, x, u, flag)

% Choose the function performed currently by the S-function
switch flag

    % Initialization
    case 0

        str = [];          % Empty (default behavior)
        ts  = [0 0];       % Default values for continuous systems

        % Dimensions of the system (states, inputs and outputs)
        sys_dims = simsizes; % simsizes: MATLAB construct for
                               % initialization purposes

        % Problem-specific dimensions
        % The names of the fields of sys_dims are expected by Simulink
        sys_dims.NumContStates = 4; % Num. continuous states
        sys_dims.NumDiscStates = 0; % Num. discontinuous states
        sys_dims.NumInputs     = 2; % Num. of inputs (Fr, Qj)
        sys_dims.DirFeedthrough = 0; % Num. of feedthroughs (matrix
D)
        sys_dims.NumSampleTimes = 1; % Default for continuous systems

        sys_dims.NumOutputs = 4; % Num. of outputs (C_A, C_B, T_R,
T_J;
                               % The measurements are specified in
                               % the block diagram with the matrix
C)

        % Output: structure with system dimensions
        sys = simsizes(sys_dims);

        % actual initial conditions
        x0_actual = [0; 0; 387.05; 387.05];

        % part7 initial conditions
        C_A_ss = 1.6329;
        C_B_ss = 1.1101;
        T_R_ss = 398.6581;
        T_J_ss = 397.3736;

        x0_7_1 = [C_A_ss*0.9; C_B_ss*0.9; T_R_ss - 10; T_J_ss - 10];
        x0_7_2 = [C_A_ss*1.1; C_B_ss*1.1; T_R_ss + 10; T_J_ss + 10];

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    % USER: Output: initial conditions
    x0 = x0_7_1;

% Evaluation of the derivatives
case 1

    % Output: RHS of the ODE system
    sys = reactor_model_ode_rhs(x, u);

% Evaluation of the outputs (y = C*x)
case 3

    % System outputs
    % (the measurements are specified in
    % the block diagram with the matrix C)
    sys = x;

% Additional flags (values = 2, 4 and 9)
case {2 4 9}

    sys = [];

otherwise

    error('Unknown flag');

end

% -----
% EOF
% -----

Not enough input arguments.

Error in reactor_nonlinear_sfcn (line 12)
switch flag

```

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