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function [A,B,C,D] = linearmodSS(paravec)
% This function generates the linear model for running the linear plant

Vr = paravec(1);
Tf = paravec(2);
lambda = paravec(3);
Ca = paravec(4);
ko = paravec(5);
E = paravec(6);
R = paravec(7);
rho = paravec(8);
Cp = paravec(9);
U = paravec(10);
Aj = paravec(11);
Vj = paravec(12);
Tcin = paravec(13);
rhoj = paravec(14);
Cj = paravec(15);
Tjo = paravec(16);
Trs = paravec(17);
Tjs = paravec(18);
Cas = paravec(19);
F = paravec(20);
Fj = paravec(21);
ks = ko*exp((-E)/(R*Trs));

% linearized plant equation equations
% A matrix of the states (Conc of A, Tr and Tj)
A(1,1) = (-F/Vr)-Vr*ks;
A(1,2) = ((-E)*Vr*Cas*ks)/(R*Trs^2);
A(1,3) = 0;
A(2,1) = (-lambda*ks)/(rho*Cp);
A(2,2) = (-F/Vr) - ((lambda*Cas*ks*E)/(rho*Cp*R*Trs^2)) - (U*Aj/(Vr*rho*Cp));
A(2,3) = U*Aj/(Vr*rho*Cp);
A(3,1) = 0;
A(3,2) = U*Aj/(Vj*rhoj*Cj);
A(3,3) = -Fj/Vj - U*Aj/(Vj*rhoj*Cj);

% B matrix
B(1,1) = 0;
B(2,1) = 0;
B(3,1) = (Tjo-Tjs)/Vj;

C = [0,1,0];
D = [0];
end

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