% Define the cost function (Lyapunov function)

syms s c K

V = 1/2 \* s^2;

% Calculate the gradient of the cost function

dVdc = diff(V, c);

dVdK = diff(V, K);

% Initialize the sliding mode parameters

c\_old = 5;

K\_old = 1;

% Set the learning rate

alpha = 0.01;

% Loop until convergence

for i = 1:1000

% Calculate the gradient of the cost function with the current parameters

dVdc\_val = subs(dVdc, [s, c, K], [s\_val, c\_old, K\_old]);

dVdK\_val = subs(dVdK, [s, c, K], [s\_val, c\_old, K\_old]);

% Update the sliding mode parameters using gradient descent

c\_new = c\_old - alpha \* dVdc\_val;

K\_new = K\_old - alpha \* dVdK\_val;

% Update the old parameters

c\_old = c\_new;

K\_old = K\_new;% Update the sliding mode parameters using gradient descent c\_new = c\_old - all; K\_new = K\_old - alpha \* dVdK\_val; % Update the old parameters c\_old = c\_new; K\_old = K\_new;

end

% Use the optimized sliding mode parameters to control the system

u = 1/154.3681 \* (c\_old \* e\_dot + X\_ddot\_ref + 0.012 \* X\_dddot + 2359.561 \* X\_dot - K\_old \* sign(s))