ESTIMATION OF SOC AND SOH ALGORITHM

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% Battery model parameters
R0 = 0.1; % Battery internal resistance (Ohms)
C = 1000; % Battery capacity (Ah)
alpha = 0.9; % SoH decay factor
% Measurement noise covariance
Q = diag([0.01, 0.01]); % Process noise covariance
R = diag([0.05, 0.05]); % Measurement noise covariance
% Initial estimates and covariances
x_est = [0.5; 0.9]; % Initial estimates of SoC and SoH
P = diag([0.1, 0.1]); % Initial covariance matrix
% Simulated current and voltage measurements
time = 0:0.1:10;
current = sin(time); % Simulated current profile
voltage = R0 * current + C * alpha * (1 - exp(-time/alpha)) + randn(size(time))*sqrt(R(2,2));
% Kalman filter estimation
for i = 1:length(time)
% Prediction step
x_prd = x_est; % State prediction
P_prd = P + Q; % Covariance prediction
% Update step
H = [x_prd(1), 0; 0, x_prd(2)]; % Measurement matrix
z = [voltage(i); current(i)]; % Measurement vector
S = H * P_prd * H' + R; % Innovation covariance
K = P_prd * H' / S; % Kalman gain
x_est = x_prd + K * (z - H * x_prd); % State estimation
P = (eye(2) - K * H) * P_prd; % Covariance estimation
```