# Pade Approximation Degradation Tutorial

Pade Approximation Degradation is the code of lithium-ion battery cell model with degradation. ($2^{nd}$, $3^{rd}$, $4^{th}$, $5^{th}$, and $6^{th}$ order models)

(1)

To run the code, open the file "Combined_Run_Model.m" and run.

(2) Simulink file

"Combined_Pade_Model_D.slx" is the Simulink file.

(3) Function

- "state_eqns_combined_2_n.m" is the function to calculate the state vector of the negative concentration of $2^{nd}$ order Pade approximation battery cell model.
- "state_eqns_combined_2_p.m" is the function to calculate the state vector of the positive concentration of $2^{nd}$ order Pade approximation battery cell model.
- "output_C_2.m" is the function to calculate the negative and positive surface concentration of $2^{nd}$ order Pade approximation battery cell model.
- "output_V.m" is the function to calculate the output voltage of the battery cell model.
- "input_c.m" is the function of pulse input.

(4) .mat file

"UDDS_current_profile.mat" is the input current and time data of the UDDS driving cycle.
"UDDS_current_profile_7000.mat" is the 7000 sec input current and time data of the UDDS driving cycle.

## Specific explanation of variables and equations are denoted as annotation in the code.