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```
function M3Exec_001_23

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% ENGR 132
% Program Description
% Loads heating and cooling data relevant to Milestone 4. Calls
 slightly
%     modified Parameter ID function from Milestone 3 to obtain the
%     parameters for each time history. Calls the piecewise function
 from
%     Milestone 2 to model each dataset based on the parameters.
 Finally calls
%     Plot and SSE functions from Milestone 2 to display the results
 of the
%     regression.
%
% Function Call
% M3Exec_001_23
%
% Input Arguments
% None
%
% Output Arguments
% None
%
% Assignment Information
%   Assignment:        M3
%   Author:             Nicolas Fransen, nfransen@purdue.edu
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%   Team ID:            001-23
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

INITIALIZATION

```
% Load data
coolNoisy = load("M4_Data_CoolingTimeHistory.csv");
heatNoisy = load("M4_Data_HeatingTimeHistory.csv");

cnType = "cooling";
hnType = "heating";
```

CALCULATIONS & FORMATTED TEXT & FIGURE DISPLAYS

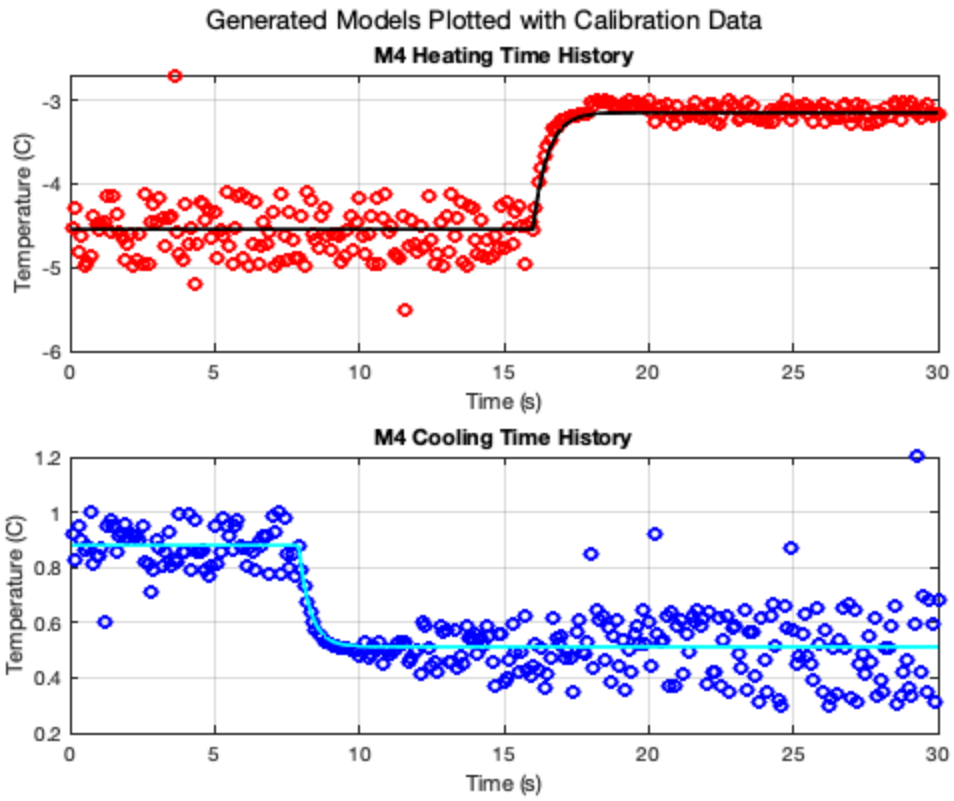
```
% get parameters for each dataset
[cn_yl, cn_yh, cn_ts, cn_tau] = M3ParameterID_001_23(coolNoisy(:,1),
 coolNoisy(:,2), cnType);
[hn_yl, hn_yh, hn_ts, hn_tau] = M3ParameterID_001_23(heatNoisy(:,1),
 heatNoisy(:,2), hnType);

% get modeled values for each dataset
cn_modeledValues = M2Piecewise_001_23(coolNoisy(:,1), cnType, cn_ts,
 cn_yl, cn_yh, cn_tau);
hn_modeledValues = M2Piecewise_001_23(heatNoisy(:,1), hnType, hn_ts,
 hn_yl, hn_yh, hn_tau);

% Call Plot
M2Plots_001_23(coolNoisy, heatNoisy, ...
  cn_modeledValues, hn_modeledValues);

% Call SSE
M2SSEmod_001_23([coolNoisy(:,2), cn_modeledValues], [heatNoisy(:,2),
 hn_modeledValues]);
```

The SSE MOD value for the M4 Heating data is: 0.0560
The SSE MOD value for the M4 Cooling data is: 0.0104



ANALYSIS

```
% Table 1 - Identified Parameters from Heating Time History

    % yL       -4.55 F
    % yh       -3.15 F
    % ts        16 s
    % tau       0.4s


% Table 2 - Identified Parameters from Cooling Time History

    % yL        0.5 F
    % yH        0.875 F
    % ts        7.9 s
    % tau       0.4 s
```

-- Q1 - Heating Data Analysis

```
% 1. Comparison of the actual identified parameter values with the
 target values

% yL: Our calculated yL value is -4.5467 F, rounded matching the
 target value of
%     -4.55 F exactly
```

```
% yH: Our calculated yH value is -3.1488 F, rounded matching the
 target value of
%     -3.15 F exactly
% ts: Our calculated value of ts is 16 s, matching the target value of
 16 s
% tau: Our calculated tau value is 0.5 s, only 0.1 s off the target
 value of 0.4s

% 2. Analysis of the SSE mod values

% The SSE mod value for our M4 Heating data model is 0.0560, a very
 small value
%     indicating a high level of accuracy. The value is especially
 small due to
%     the very small range of temperature difference in the
 Calibration data

% 3. Analysis of output plots

% Looking at our output plot for M4 Heating data, the model line
 appears to represent the
%     data extremely well, following along inside the band of noise of
 the data and being
%     a good predictor of the function value. This is reinforced by
 our low SSE mod value.
```

-- Q2 - Cooling Data Analysis

```
% 1. Comparison of the actual identified parameter values with the
 target values

% yL: Our calculated yL value is 0.5129 F, rounded matching the target
 value of
%     0.5 F exactly
% yH: Our calculated yH value is 0.8790 F, only 0.004 F away from the
 target
%     value of 0.875 F
% ts: Our calculated value of ts is 7.9 s, matching the target value
 of 7.9 s
% tau: Our calculated tau value is 0.4 s, matching the target value of
 0.4 s

% 2. Analysis of the SSE mod values

% The SSE mod value for our M4 Cooling data model is 0.0104, even
 smaller than the
%     SSE mod value for M4 Heating data. This is unusual due to the
 appearence of more
%     noise on the Cooling data compared to the Heating data. However,
 this low value
%     further demonstrates the effectiveness of our algorithm in
 processing noisy data.
```

```
% 3. Analysis of output plots

% Looking at our output plot for M4 Cooling data, the model line
 appears to follow the
%     data very well, staying within the bounds of noise. The SSE mod
 value for this
%     dataset is lower than the value for M4 Heating data, which is
 unusual due to the
%     appearance of more noise.
```

IMPROVEMENTS

```
% A potential area of improvement for our algorithm is adding the
 ability to process and
%     eliminate clear outliers in the dataset. The parameters already
 exist to
%     automatically calculate whether a data point is an outlier, with
 only slight
%     modifications to the overall algorithm.
```

ACADEMIC INTEGRITY STATEMENT

I/We have not used source code obtained from any other unauthorized source, either modified or unmodified. Neither have I/we provided access to my/our code to another. The project I/we am/are submitting is my/our own original work.

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