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function [ymin,ymax,tstep,tauTime, isHeating] = M3Alg2_014_05(data)
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% ENGR 132
% Program Description
%   Calculates min max timestep and tau variables and outputs them
% Version Changes: Modified some hard coded values to deal with all
 the data
%
% Function Call
%  [ymin,ymax,tstep,tauTime] = M2Alg2_014_05(data)
%
% Input Arguments
%   1. data: contains the raw data for noisy/clean cooling/heating
%
% Output Arguments
% 1. ymin - the mimimum value of the data
% 2. ymax - the maximum value of the data
%   3. tstep - timeStep of the passed data
% 4. tauTime - the time constant of the data
%
% Assigment Information
%   Assignment:       Final Project
%   Authors:             Peter Swales, pswales@purdue.edu
%       Colin Jamison, cjamison@purdue.edu
%   Team ID:            014-05
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

% Peter Swales: coded lines 1-40
% Colin Jamison coded lines 42-56

time = data(:,1); % column vector of time(sec)
temp = data(:,2); % column vector of temperature(C)
tempFirst100 = temp(1:100); %seperates the first hundred temp data
 points
avgPrior = mean(tempFirst100); %inititalizes the average before the
 value of n
avgDiff = 0; % initializes the average difference to enter the while
 loop
n = 101; %initializes data point number to the first value after the
 100 used to initialize the average

while abs(avgDiff) < 1 %tests to see if the loop has reached tstep
    avgPrior = mean(temp(1:n)); %average of all temp data before the
 nth data point
    ntest = n + 50; %calculates the max for the range of n values to
 test the average for
    avgAfter = mean(temp(n:ntest)); % average of temp values from the
 nth value to the "n+50"th value
    avgDiff = avgPrior - avgAfter; % difference between the averages:
 will be greater than one at tstep

    n = n + 5; % increments n by 5 to reduce redundant calculations
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end
tstep = time(n); % the last n value will be the location of tstep
ymin = avgPrior; % ymin is the average of all data points before tstep

nNew = n; %initializes a new value of n to keep track of tsteps
 location
ymaxData = temp(length(temp) - 50:length(temp)); % the last 50
 temperatures of the data set
ymax = mean(ymaxData); % takes the average of the last 50 temps to
 find ymax
fac1 = .632; % initializes a factor for heating
fac2 = 5; %intitializes a factor for heating, the value 5 is used to
 ensure the loop collects all data points needed to calculate tau
isHeating = 1; %EDITED BY ALEX PIEPRZYCKI
if ymin > ymax %true if data set is for cooling instead of heating
    isHeating = 0; %EDITED BY ALEX PIEPZYCKI
    yminTemp = ymin; %these three lines flip the values of ymin and
 ymax
    ymin = ymax;     %^
    ymax = yminTemp; %^
    fac1 = 1 - fac1; %changes the factor(.632) for cooling
    fac2 = -5;       %changes the factor(5) for cooling
end

tauTemp = (ymax - ymin) * fac1 + ymin; %calculates the temperature at
 the time constant
tempNew = 1000; %intitalizes the variable temp to enter the loop
tauCount = 0;   %the number of data points used to calculate tau
tauTimeTot = 0; %the sum of all data points used to calculate tau

while abs(tauTemp - tempNew + fac2)> 0.5 % tests all values of n until
 5 degrees past the temperature at tau EDITED BY PETER SWALES
 tempNew = temp(nNew); % the temperature at the nth data point
    tempDiff = abs(temp(nNew) - tauTemp); % difference between the nth
 data point and the temp at tau
    if tempDiff < 0.4 %true once the tempNew is within 0.1 degrees of
 the temp at tau  EDITED BY PETER SWALES
        tauTimeTot = tauTimeTot + time(nNew); % adds on the usable
 data point to the set of times for tau
        tauCount = tauCount + 1; % counts how many data points are
 used to calculate the time at tau
    end
    nNew = nNew + 1; % increments the data point to test the next
 temperature
end
tauTime = (tauTimeTot / tauCount) - tstep; % the time at tau will be
 the sum of the data points collected divided by the number of data
 points


ymin =

    0.5077
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ymax =

  100.8127

tstep =

    1.3633

tau =

    0.2337

isHeating =

     0
```

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