Assignment 5 – Linear modeling

You need to calculate:

1. Average Force (AF) → mean(signal)
2. Dynamic Range (DR) → max(signal) – min(signal)
3. Mean-Squared (MS) → sum(signal^2) / signal_length
   - signal_length → notice that the signals are different and have different lengths
4. Zero-Crossing Rate (ZCR) → ZC/time_duration = ZC per second
   - time_duration → notice that the signals are different and have different durations
   - ZC → you can use these functions: sign, diff, abs → read the documentation and learn what do they output.
   - N.B. You may need to first draft the formula by hand.
5. Turns Count Rate (TCR) → follow the algorithm steps and the cheat sheet.
6. Use polyfit to calculate the linear model coefficients for each parameter.
7. Use corr function to calculate the correlation coefficient between AF and other parameters. Make sure to input the correct shape of the signals e.g., transpose can be used if necessary!

What you must learn first:

1. plotting.
2. loops.
3. functions and function handles in MATLAB.
4. cellfun.
5. struct data type.
6. cell data type.

Hint for TCR:
It is worth noticing that there are cases that are considered as [turn – not turn] for derivative signs:

- -ve followed by -ve (difference = 0, multiplication = 1) → Not turn
- +ve followed by +ve (difference = 0, multiplication = 1) → Not turn

- -ve followed by +ve (difference = -2, multiplication = -1) → Turn
- -ve followed by 0 (difference = -1, multiplication = 0) → Turn
- +ve followed by -ve (difference = 2, multiplication = -1) → Turn
- +ve followed by 0 (difference = 1, multiplication = 0) → Turn
- 0 followed by 0 (difference = 0, multiplication = 0) → Turn
- 0 followed by +ve (difference = -1, multiplication = 0) → Turn
- 0 followed by -ve (difference = 1, multiplication = 0) → Turn

you can notice that using difference and find values more than "0" makes the case (**0 followed by 0**) not counted.
while using multiplication and comparing to <=0 counts all the valid cases.

Also, notice that the points in the derivative signal are less than the original signal by one sample. Thus, the coordinates should be shifted by 1.

i.e., *correct_coordinates = derivative_coordinates +1*.

Cheat sheet:

You can find a cheat sheet for the assignment in the news!