ECE280 - Lab 2: Introduction to SimuLink

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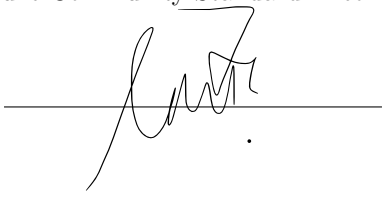
I have adhered to the Duke Community Standard in completing this assignment.



Contents

1 Introduction

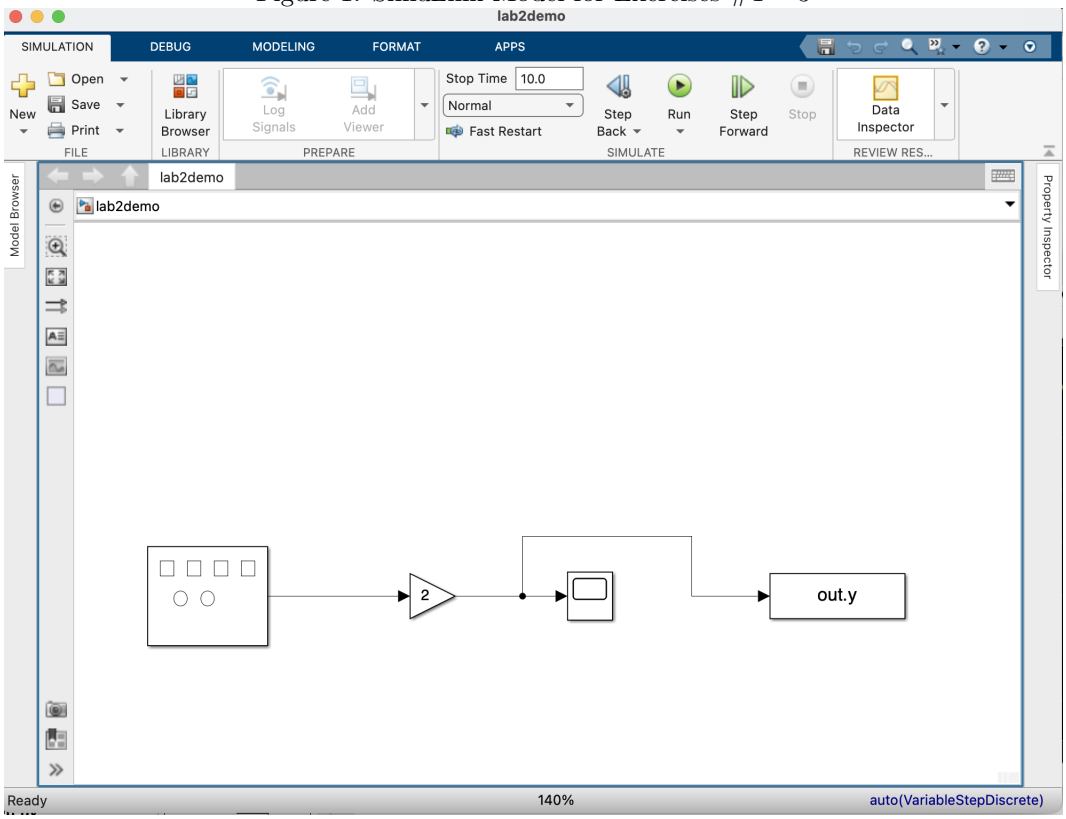
INSERT Objectives The goals of this lab exercise are to: - Get familiar with launching and navigating Simulink - Grasp the basic blocks of simulink and how to connect them - Learn to create custom functions, transfer data between a Simulink model and the MATLAB workspace, and print models - Develop skills in generating various signals, performing basic mathematical operations, combining these operations to form a system, visualizing and saving data, and publishing your model - Construct and simulate a simple system to analyze stock price data

2 Results

- Results for Exercises #1 – 3.

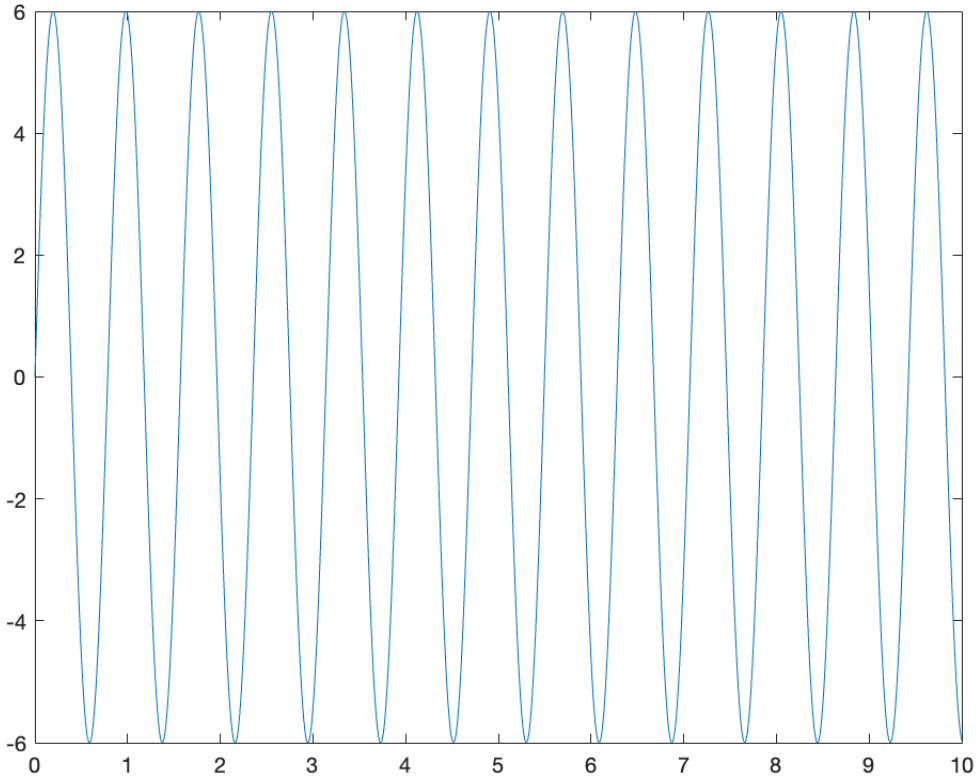
A) Model

Figure 1: SimuLink Model for Exercises #1 – 3



B) Plot

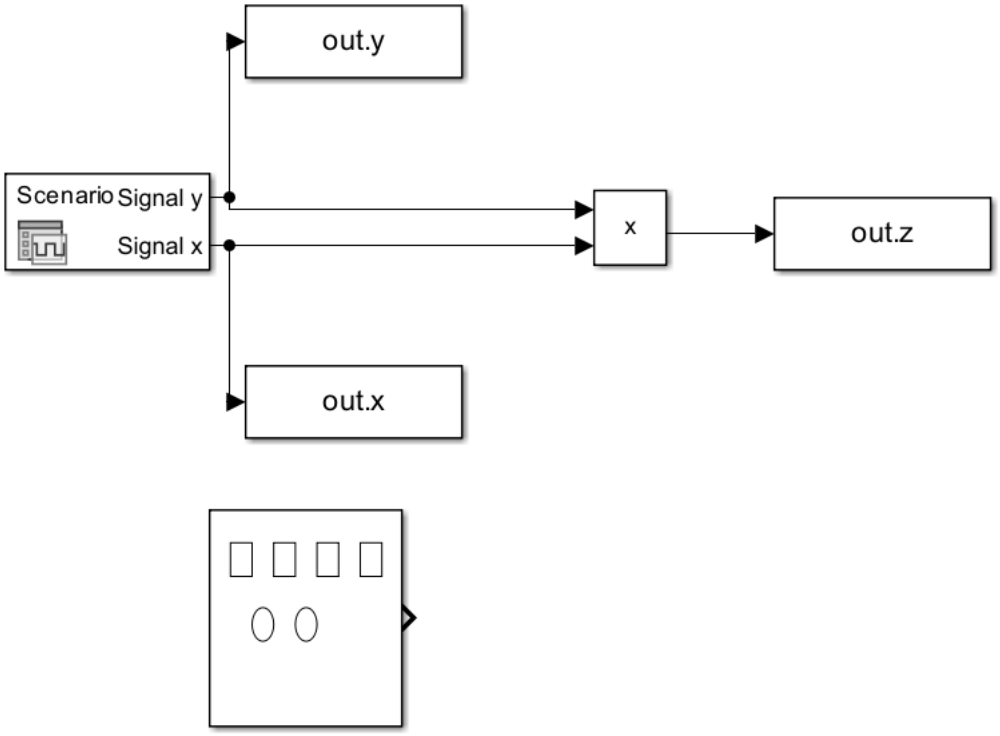
Figure 2: Exercise 3 High Step From MatLab Plot



- Results for Exercise #4.

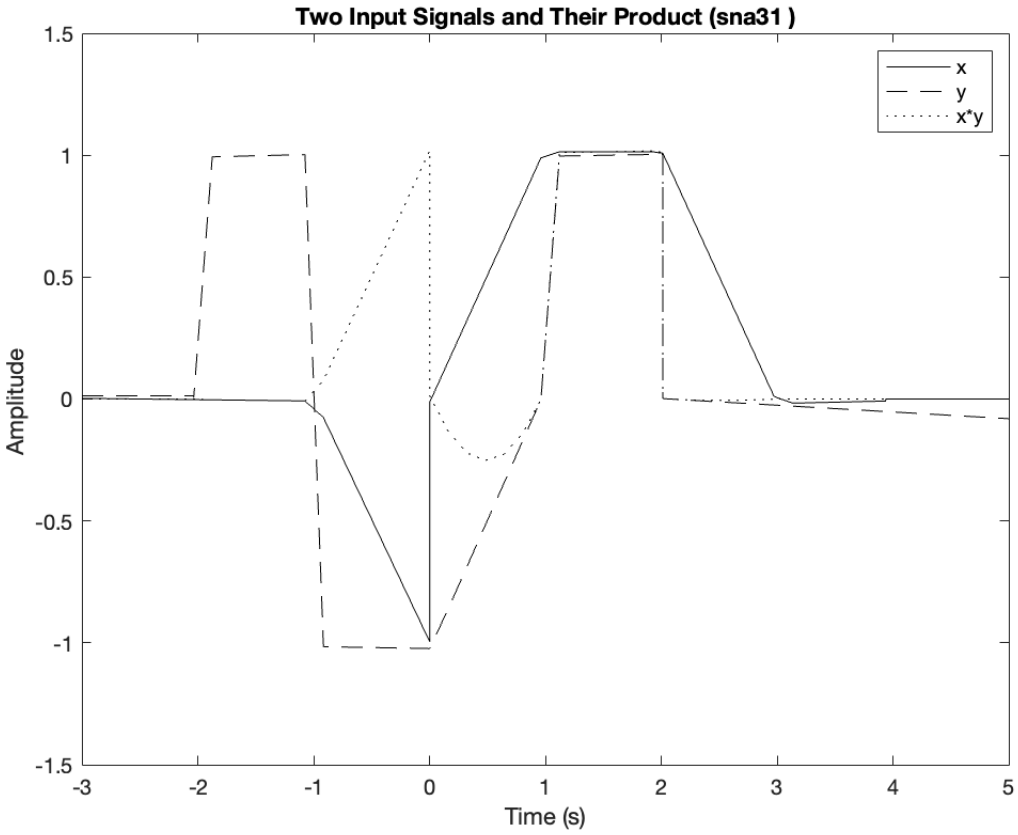
  A) Model

Figure 3: SimuLink Model for Exercises #4



B) Plots

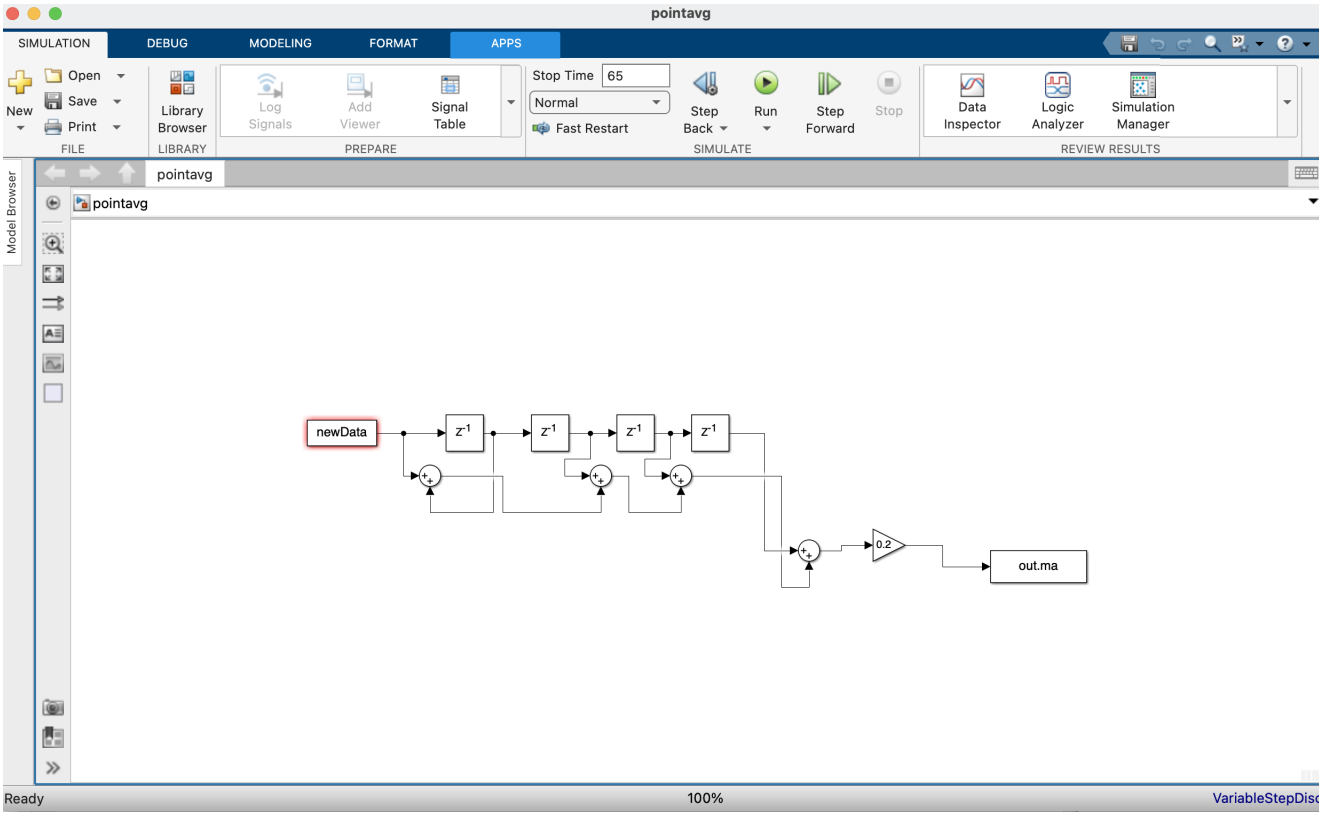
Figure 4: Exercise 4 Graphs of x, y, and x*y



- Results for Exercise #5.

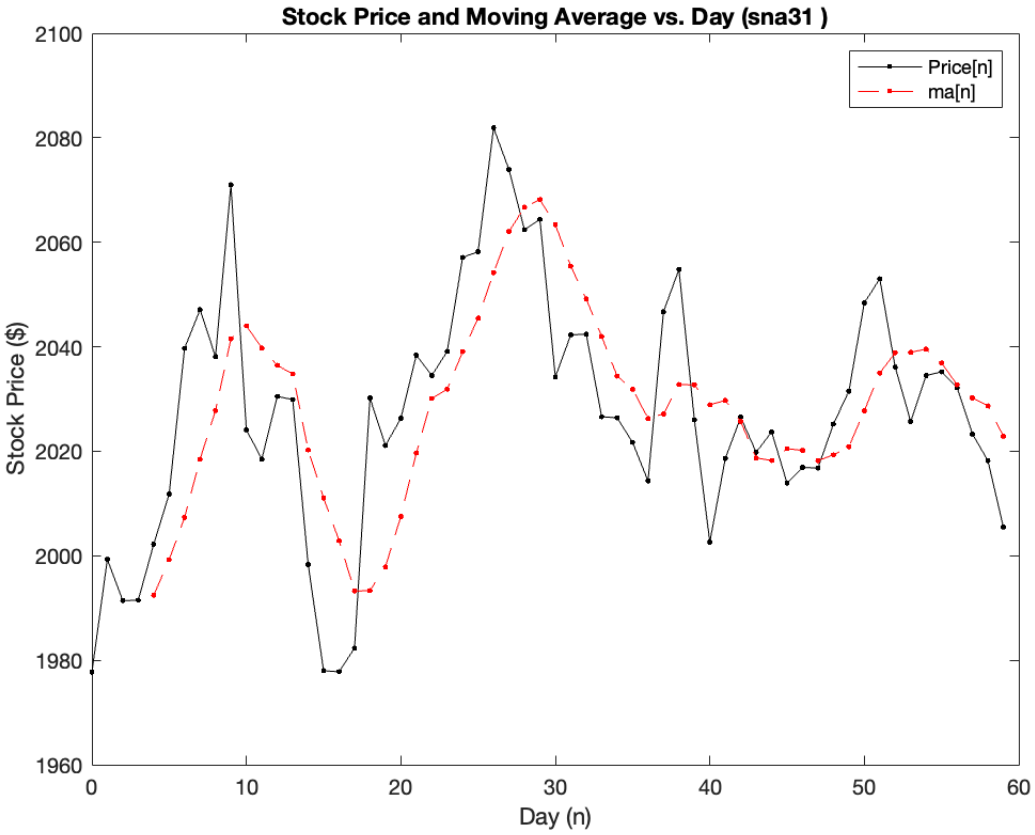
  A) Model

Figure 5: SimuLink Model for Exercises #5



B) Plots

Figure 6: Exercise 5: Moving Average



3 Discussion

- Discussion for Exercise #5.

  A) Why did the plot command for StockPrices in Exercise #5, part 4. use $'ma(5:Days)'$ and not $'ma'$? This is because in the calculation for moving averages , we account for a delay of up to 5 in the definition of "y[n]"

  B) What is the length of the output vector?

  The length of the vector is 60 as specified in our code

  C) What do you observe about the length of the output relative to the length of the input?

  The length of the the output is also 60 (same as length of the input)

  D) Why is this the case?

  This is because each output is generated directly from an input. Thus 60 inputs lead to 60 outputs

  E) What do you observe about the values of the output (ma) relative to the input (StockPrices)? Comment both on the initial values of ma and on the overall pattern in the output relative to the input. Explain these results in terms of the system that you implemented.

  Both graphs followed a consistent pattern with the output being lesser than the input on positive slopes whilst the input was lesser on negative slopes, and this trend was consistent through the defined period of 60 days.

  F) Justify whether the system has memory or is memoryless.

  The system has memory since it includes delays that can be represented as past inputs

G) Justify whether the system is casual or not casual.

The system is casual since the impulse response is 0 for t less than 0. In other words, the system depends only on past and present inputs or results

H) Justify whether the system is stable or not stable.

The system is stable because when the input is bounded , the output is also bounded and doesn't grow beyond bounds

I) Justify whether the system is time invariant or time varying.

The system is time invariant. Period shifts and delays of same magnitude yield the same results

J) Justify whether the system is linear or non-linear.

The system is linear because it follows the rules of additivity, homogeneity, and superposition

4 Conclusions

Simulink can be used to model real-life systems and scenarios for the purpose of analysis and predictive analysis, although this is usual hypothetical since real-life systems are mostly non-causal. Simulink provides wonderful tools that can be used for signal and system analysis. The properties of systems are indicative of the signal inputs, outputs and impulse responses.

5 Extension