Simulink Desktop Real-Time for Lab 1

1. Chose a directory where you want to work. Then start Matlab and change to that directory in Matlab. Type *simulink* at the Matlab prompt. On the next screen that pops up, click on the "Blank Model" tab.

2. Create and run an m-file to assign values to all of the variables that will be used in the Simulink model, including the sampling interval, `T`.

3. In the Simulink window, click on the red, white, and blue icon to bring up the Simulink Library Browser. Click and drag the following components to the Simulink workspace: Two *Step* blocks (found in *Sources*), an *Add* block and a *Gain* block (found in *Math Operations*), *Derivative* block (found in *Continuous*), a *Scope* (found in *Sinks*), *Encoder Input* and *Analog Output* (D/A) blocks (found in *Simulink Desktop Real-Time*).

4. At the top of the Simulink model, change the time from 10.0 to however many seconds you want the system to run (for Lab 1 use 1 sec.).

5. Connect the blocks together and set the parameters of each block. Set the sample times of all the digital blocks to `T`.

6. Configure the Scopes to send their data to the Matlab workspace as an array using simple variable names like `u` and `v`. Give the scope blocks in the Simulink diagram a name (e.g. Motor Velocity, Plant input).

7. Double click on the Analog Output and Encoder Input Blocks. If you see `<no board selected>` click on `Install New Board` and select `Humusoft MF634`. Click `Okay` in the window that pops up. Configure these blocks **using the information at the bottom of this page.**

8. At the top of the Simulink model click the *Modeling* tab and click *Model Settings*:

   (a) Click on **Solver**. Change *Type* to `Fixed Step`. Click on *Solver Details.* In the *Fixed Step Size* box type in `T`.

   (b) Click on **Data Import/Export**. Uncheck the *Single Simulation Output* box.

   (c) Click on **Code Generation**. Browse for the *System Target File.* Choose *sldrt.tlc (Simulink Desktop Real-Time).*

9. Click on **Desktop Real-Time** tab. In the upper left, click the black arrow below *Simulation*, make sure the *Mode* is **Run Model in Kernel Mode**. Also, to the left of *Stop Time* click on black arrow. Then click on **Control Panel** icon. Select *Signal & Trigger* and set the duration to 100000.

10. Click on the black arrow below *Run in Real Time.* The sequence is (*black arrow*)**Build**, (*black arrow*)**Connect**. Once the green **Start** arrow is visible and you can click it to run the hardware. If the *Build* icon is visible, you can click on *Connect.*

Analog Output

Board Select	MF634
Sample Time	T
Output Channel	Get from cable
Output Range	-10 to 10
Initial Value	0
Final Value	0

Encoder Input

Board Select	MF634
Sample Time	T
Input Channel	Get from cable
Quadrature Mode	Quadruple
Reset Input Function	Rising edge index