Simulink Desktop Real-Time for Lab 1

1. Chose a directory where you want to work. Start Matlab and change to that directory in Matlab. 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`.

2. Type *simulink* at the Matlab prompt. On the next screen that pops up, click on the "Blank Model" tab.

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*), *Discrete State Space* block (found in *Discrete*), 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`. Double click on the Analog Output and Encoder Input Blocks. If you see `<no board selected>` click on the black arrow. If no board name appears click on `Install New Board` and select `Humusoft MF634`; otherwise chhose `Humusoft MF634`. Click `Okay` in the window that pops up. Configure these blocks **using the information at the bottom of this page.**

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. 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).*

8. Click on **Desktop Real-Time** tab. In the upper left, under *Simulation*, click on *Connected IO* and select **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 add two zeros to *Duration* resulting in 100,000.

9. 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 model has already been built you can click on **Connect** (no need to Build again).

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