

Introduction

This part will introduce students to the basic concepts of creating a design(Digital PID controller) using System Generator within the model based design flow provided through Simulink. The design is a simple multiplyadd circuit.

Required Software

The e models described in this work are included with HDL Coder: “Using Xilinx System Generator for DSP with HDL Coder”.

Simulation and code generation from the models have been tested with the following versions of the software:

-MATLAB (R2009b)

- Simulink

-HDL Coder (requires MATLAB Coder and Fixed-Point Toolbox)

-Xilinx System Generator for DSP Version 12.1

To simulate, synthesize, and implement HDL code generated from the model, the following software is also required:

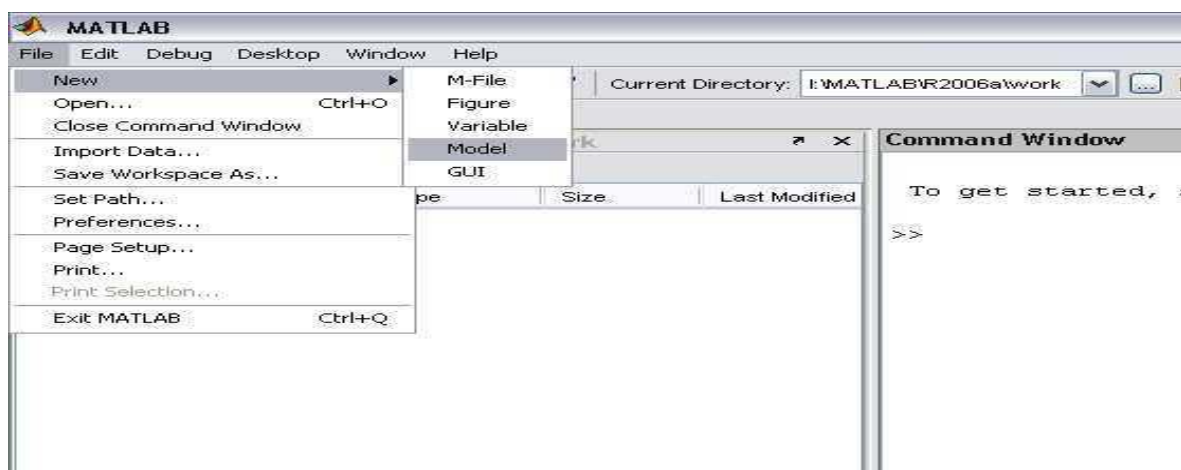
-Xilinx ISE Design Suite Version 12.1(DSP Edition or System Edition)

Procedure

1. Launch the MATLAB program

2. Simulink

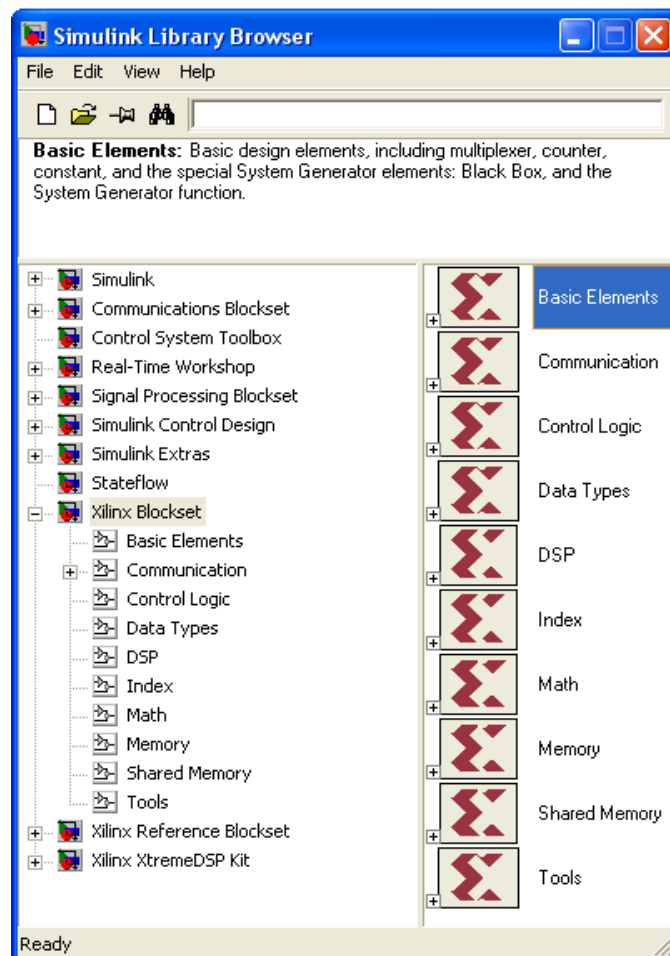
The starting place for this programming progress is in MatLab. So once the programming package is open, create a new model by clicking the File tab and dragging to the New tab and then the Model Tab



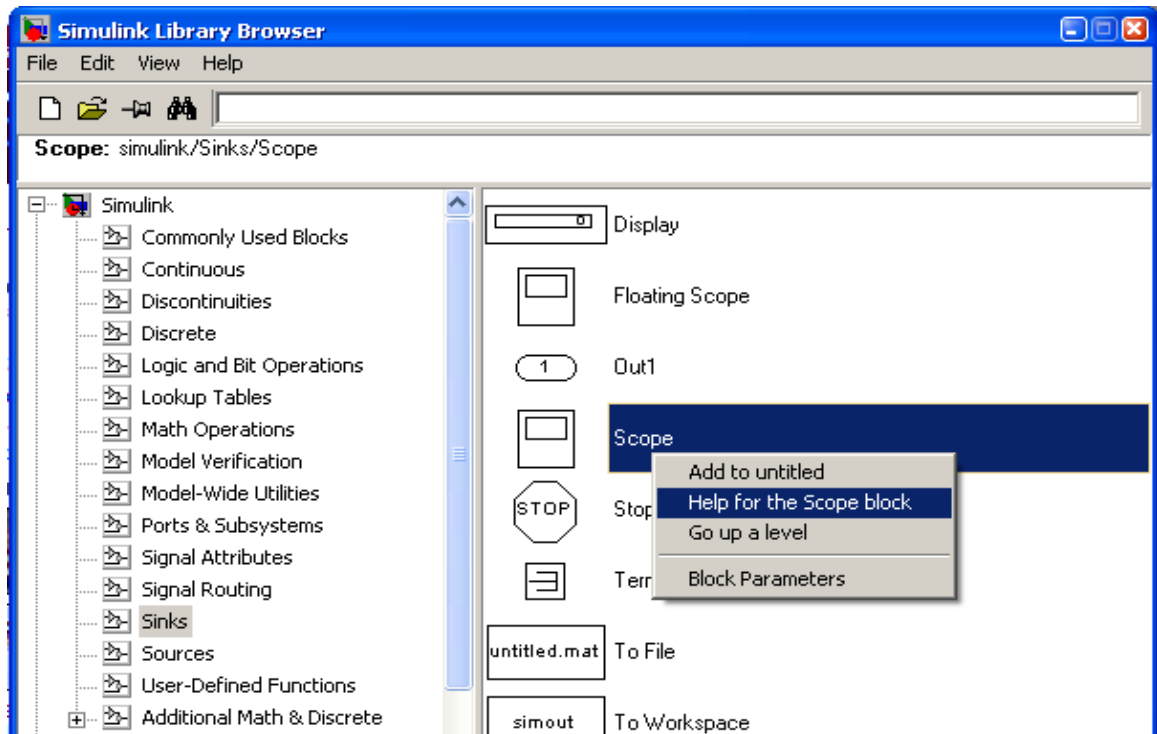
3.Launch Simulink: Type simulink at the MATLAB command prompt or click on the simulink button on the MATLAB tool bar to open the Simulink library browser.

4.Look at the blocks available in the Simulink Library Browser. The following elements, among others, should appear:

- Simulink (sources and sinks)
- Signal Processing Blockset
- Xilinx Blockset
- Xilinx Reference Blockset



5.Right-click any block in the library browser, and choose Help from the MATLAB menu.



6. In the library browser window, expand the **Simulink Library**, and click **Source**

7. The Xilinx Block Set, Gateways

Use the Xilinx Gateway In, Gateway Out, System Generator, and MUX blocks, as shown below, which provide interface to Xilinx Blocksets in Simulink

From the **Xilinx Blockset** (in the **Simulink Library Browser**), open **Basic Elements** and drag the **Gateway In** block onto the design sheet. Drop it on the connection between the Sine Wave and the output Scope. It will automatically insert itself.

Note: The Gateway In/Out blocks are required to convert double-precision floating point numbers used by Simulink in a simulation to bit fix point numbers used by Xilinx blocks. Thus, a conversion is required when communicating with Xilinx blocks and Simulink blocks.

1. Double-click Gateway In to open the Block Parameters
2. Set the Number of bits to 16 and Binary Point to 14
3. Similarly, drag a Gateway Out block onto the sheet, and drop it between the Gateway In block and the output Scope block

8.Add and connect a Simulink **MUX** between the **Gateway Out** and the **Scope** by using **Simulink** → **Signal Routing**

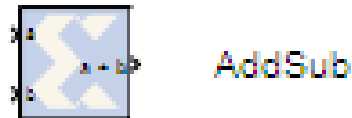
9.Add a **system generator** token from the **Xilinx Blockset** → **Basic Elements** library to the design



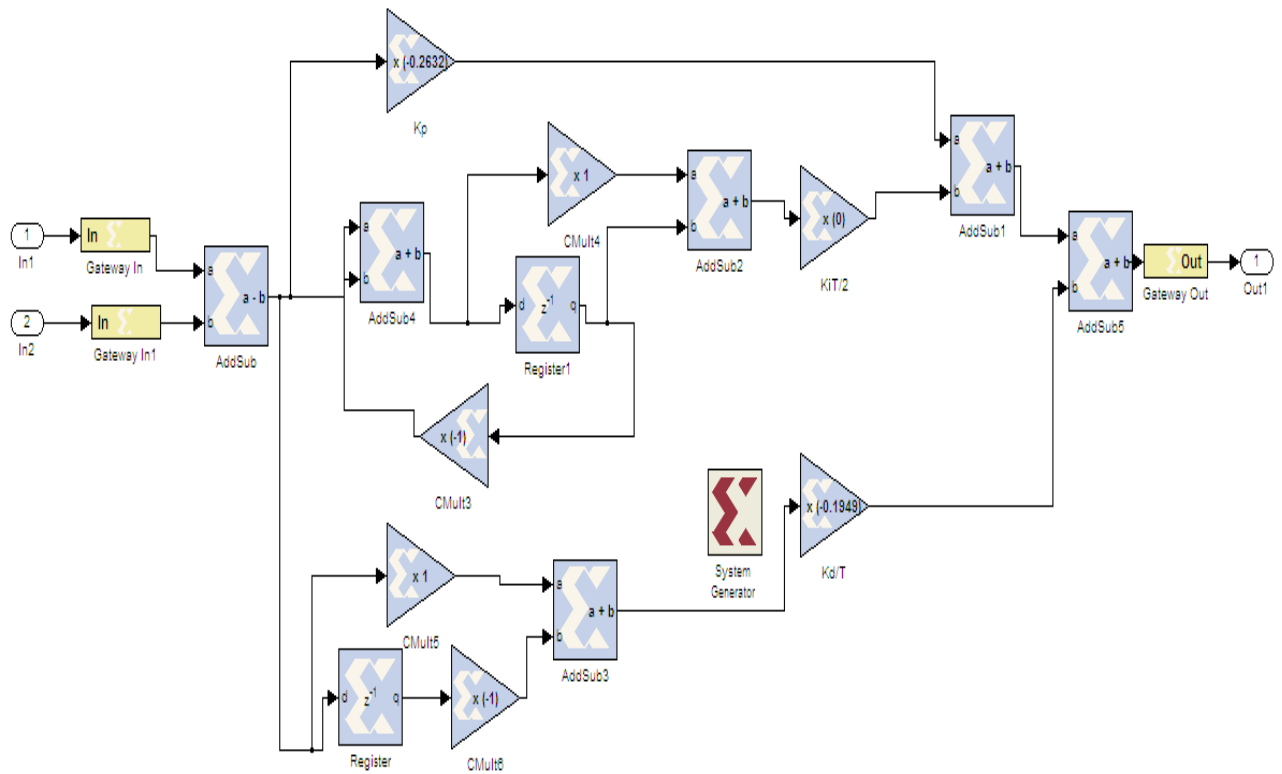
10.Add the **Register** block from the Basic Elements library of the Xilinx **Blockset**.



11.Add the **AddSub** block from the Basic Elements library of the Xilinx **Blockset**.



12.Repeat steps 7,8,9,10,11 until the design looks like figure



13.Wire all the blocksand The final diagram should look like figure 26

