**The lecture 7**

Many model building actions, such as copying a block or deleting a line, require that you first select one or more blocks and lines (objects).

**Selecting One Object**

To select an object, click it. Small black square “handles” appear at the corners of a selected block and near the end points of a selected line. For example, the figure below shows a selected Sine Wave block and a selected line.



When you select an object by clicking it, any other selected objects are deselected.

**Selecting More Than One Object**

You can select more than one object either by selecting objects one at a time, by selecting objects located near each other using a bounding box, or by selecting the entire model.

**Selecting Multiple Objects One at a Time**

To select more than one object by selecting each object individually, hold down the **Shift** key and click each object to be selected. To deselect a selected object, click the object again while holding down the **Shift** key.

**Selecting Multiple Objects Using a Bounding Box**

An easy way to select more than one object in the same area of the window is to draw a bounding box around the objects:

1.Define the starting corner of a bounding box by positioning the pointer at one corner of the box, then pressing and holding down the mouse button. Notice the shape of the cursor.



2.Drag the pointer to the opposite corner of the box. A dotted rectangle encloses the selected blocks and lines.



3. Release the mouse button. All blocks and lines at least partially enclosed by the bounding box are selected.



**Connecting Blocks**

Simulink block diagrams use lines to represent pathways for signals among blocks in a model. Simulink can connect blocks for you or you can connect the blocks yourself by drawing lines from their output ports to their input ports.

**Automatically Connecting Blocks**

You can command Simulink to connect blocks automatically. This eliminates the need for you to draw the connecting lines yourself. When connecting blocks, Simulink routes lines around intervening blocks to avoid cluttering the diagram.

**Connecting Two Blocks**

To autoconnect two blocks:

1Select the source block.



2 Hold down **Ctrl** and left-click the destination block. Simulink connects the source block to the destination block, routing the line around intervening blocks if necessary.



**Connecting Groups of Blocks**

Simulink can connect a group of source blocks to a destination block or a source

block to a group of destination blocks.

To connect a group of source blocks to a destination block:

1 Select the source blocks.



2Hold down Ctrland left-click the destination block.



To connect a source block to a group of destination blocks:

1Select the *destination* blocks.



**2** Hold down **Ctrl** and left-click the *source* block.



**Manually Connecting Blocks**

Simulink allows you to draw lines manually between blocks or between lines and blocks. You might want to do this if you need to control the path of the line or to create a branch line.

**Drawing a Line Between Blocks**

To connect the output port of one block to the input port of another block:

1Position the cursor over the first block’s output port. It is not necessary to position the cursor precisely on the port. The cursor shape changes to crosshairs.



2Press and hold down the mouse button.

3Drag the pointer to the second block’s input port. You can position the cursor on or near the port or in the block. If you position the cursor in the block, the line is connected to the closest input port. The cursor shape changes to double crosshairs.



4 Release the mouse button. Simulink replaces the port symbols by a connecting line with an arrow showing the direction of the signal flow. You can create lines either from output to input, or from input to output. The arrow is drawn at the appropriate input port, and the signal is the same.

**Drawing a Branch Line**

A *branch line* is a line that starts from an existing line and carries its signal to the input port of a block. Both the existing line and the branch line carry the same signal. Using branch lines enables you to cause one signal to be carried to more than one block.

In this example, the output of the Product block goes to both the Scope block and the To Workspace block.



To add a branch line, follow these steps:

1Position the pointer on the line where you want the branch line to start.

2While holding down the **Ctrl** key, press and hold down the left mouse button.

3Drag the pointer to the input port of the target block, then release the mouse button and the **Ctrl** key.

**Creating Subsystems**

As your model increases in size and complexity, you can simplify it by grouping blocks into subsystems. Using subsystems has these advantages:

**•**It helps reduce the number of blocks displayed in your model window.

**•**It allows you to keep functionally related blocks together.

**•**It enables you to establish a hierarchical block diagram, where a Subsystem block is on one layer and the blocks that make up the subsystem are on another.

You can create a subsystem in two ways:

**•**Add a Subsystem block to your model, then open that block and add the blocks it contains to the subsystem window.

**•**Add the blocks that make up the subsystem, then group those blocks into a subsystem.

**Creating a Subsystem by Adding the Subsystem Block**

To create a subsystem before adding the blocks it contains, add a Subsystem block to the model, then add the blocks that make up the subsystem:

1Copy the Subsystem block from the Signals & Systems library into your model.

2Open the Subsystem block by double-clicking it. Simulink opens the subsystem in the current or a new model window, depending on the model window reuse mode that you selected).

3 In the empty Subsystem window, create the subsystem. Use Inport blocks to represent input from outside the subsystem and Outport blocks to represent external output.

For example, the subsystem shown includes a Sum block and Inport and Outport blocks to represent input to and output from the subsystem.



**Creating a Subsystem by Grouping Existing Blocks**

If your model already contains the blocks you want to convert to a subsystem, you can create the subsystem by grouping those blocks:

1Enclose the blocks and connecting lines that you want to include in the subsystem within a bounding box. You cannot specify the blocks to be grouped by selecting them individually or by using the Select Allcommand.

For example, this figure shows a model that represents a counter. The Sum and Unit Delay blocks are selected within a bounding box.



When you release the mouse button, the two blocks and all the connecting lines are selected.

2 Choose **Create Subsystem** from the **Edit** menu. Simulink replaces the selected blocks with a Subsystem block. This figure shows the model after you choose the **Create Subsystem** command (and resize the Subsystem block so the port labels are readable).



If you open the Subsystem block, Simulink displays the underlying system, as shown below. Notice that Simulink adds Inport and Outport blocks to represent input from and output to blocks outside the subsystem.

