Line-Goto/From Tool

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McMaster Centre for Software Certification (McSCert)

Contents

1 Introduction

The Line-Goto/From Tool is used in MATLAB/Simulink to convert signal lines to Goto/From blocks, as well as Goto/From blocks to signal lines. The tool aims to facilitate software development activities in MATLAB Simulink by automating frequently performed actions by developers when creating, modifying, or maintaining models. The use of Goto/From blocks or signal lines helps to increase readability where appropriate. In models with many signal line crossings, converting some signal lines to Goto/From blocks will help in decluttering the model. Conversely, using signal lines for straightforward connections, instead of Goto/From blocks, will allow developers to more easily follow the visual data flow.

2 How to Use the Tool

This section describes what must be done to setup the Line-Goto/From Tool, as well as how to use the tool.

2.1 Prerequisites and Installation

1. Use MATLAB/Simulink 2011b or newer.
2. To install the tool, use one of the following approaches:
   (a) **Download the `.zip` from GitHub**
      i. Unzip the contents into your desired location.
      ii. Add the unzipped folder and subfolders to your MATLAB search path.
      iii. Download the Simulink-Utility in the same manner. Add the folder and subfolders to your MATLAB search path also. This is a dependency for the tool to work correctly.
   (b) **Use the Git command line**
      i. Use the following command to download the tool and any necessary submodules.
      ```
      git clone --recursive https://github.com/McSCert/LineToGotoFrom
      ```
      ii. Add the folder and subfolders to your MATLAB search path.
   (c) **If you already have the files**
      i. Add the tool folder and subfolders to your MATLAB search path.
3. Run sl_refresh_customizations to refresh the Context Menu.
4. Ensure your model is open and unlocked.

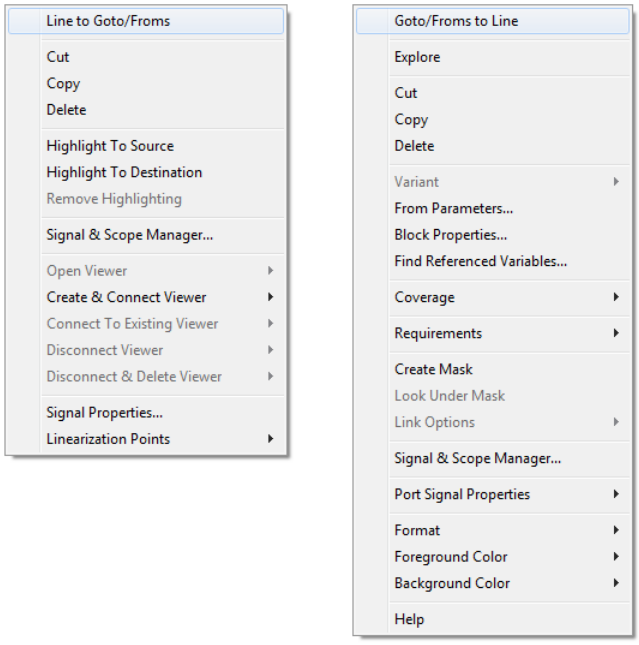

Figure 1: How the tool will appear in the Simulink Context Menu.

Troubleshooting: If running the command "`which line2Goto`" indicates that the script is not found, then the tool needs to be added to the MATLAB search path. For information on adding files to the MATLAB search path, please see the MathWorks documentation.

2.2 Getting Started

The tool can be used via the Simulink Context Menu, which can be viewed by right-clicking in a model. The following options can be available, depending on what is selected in the model. These options are listed below and shown in Figure 1.

- *Goto/Froms to Line* – Available when one or more Goto/From blocks are selected.
- *Line to Goto/Froms* – Available when one or more signal lines are selected.

Figure 2: Tool dialog window prompting for a Goto/From tag.

2.3 Functionality

This section describes the tool functionality when being used from the Simulink Context Menu (Figure 1).

Goto/Froms to Line

Selecting one or more Goto/From blocks and then selecting `Goto/Froms to Line` from the Context Menu will convert the selected blocks to signal line connections. Multiple blocks can be selected by either dragging the cursor over several blocks, or by pressing `shift` and then selecting blocks.

Goto/From blocks with global or scoped visibilities, i.e., those with corresponding blocks outside of the current subsystem, will not be converted.

Line to Goto/Froms

Selecting one or more signal lines and then selecting `Line to Goto/Froms` from the Context Menu will convert the selected signal lines to Goto/From connections. If a signal line has a name which is a valid variable name, it will automatically be used as the Goto/From tag. If the line has no name or it is an invalid variable name, the propagated signal name will be used as the tag. If propagation is off or the propagated signal name is not valid, the user will be prompted to provide a tag name through the GUI shown in Figure 2. If the tag name entered is not a valid variable name, the user will be prompted to provide another name. If the tag corresponds to existing Goto/From blocks which are within scope, that is, they will conflict, the user will be prompted to provide another name.

This operation can be done on multiple signal lines at a time. To do so, multiple lines can be selected by either dragging the cursor over several signal lines, or by pressing shift and then selecting the desired signal lines.

Note: *For* MATLAB *2011b Simulink, it is not possible to directly right-click on multiple signal lines. To overcome this, you must also select one of the source blocks of a selected signal line, and perform the right-click on this block.*

2.4 Configuration Parameters

The configuration file `config.txt` is included in `LineToGotoFrom\src`. The following configuration parameters are utilized by the tool, and can be modified by the user in order to tailor tool functionality:

- `resize_block` — Enables or disables the the resizing of Goto/From block length to a specific size.
- `static_resize` — Enables or disables the ability to resize Goto/From block length to a fixed value. Otherwise, Goto/From blocks will be resized dynamically. This parameter is used only when `resize_block` is enabled.
- `static_length` — The number of pixels that Goto/From blocks are resized to lengthwise, when `static_resize` is enabled.
- `px_per_letter` — The number of pixels to allocate per letter of a Goto/From tag, that the block will be resized to. This parameter is used when `static_length` is disabled (i.e., dynamic resizing is enabled).
- `block_offset` — The distance in pixels between Goto/From blocks and the blocks that they are connected to.
- `line_routing` — Enables or disables *autorouting* when adding new lines.
- `from_signal_naming` — Enables or disables the naming of signals out of the new From block(s) to match the signal name going into the Goto block.
- `from_signal_propagation` — Enables or disables the propagation of signals through the new From block(s).

Please see the configuration file for more details regarding parameter usage and accepted values. These parameters can be modified with MATLAB open, and do not require that MATLAB be restarted for the changes to take effect.

2.5 Errors and Warnings

Any errors or warnings during tool use will be visible in the MATLAB Command Window.

3 Example

Use the command `Line2GotoFromDemo` in the Simulink Command Window to open the example model, shown in Figure 3. There are Goto/From blocks in this example with tag A. To transform them into a signal line connection, right-click on the Goto block, one of the From blocks, or by selecting all these blocks. Then choose the `Goto/Froms to Line` option from the Context Menu. The resulting model is given in Figure 4. Likewise, to transform the line named `signalB` to a Goto/From block connection, right-click on the signal line and select the `Line to Goto/Froms` option. The resulting model is given in Figure 5.

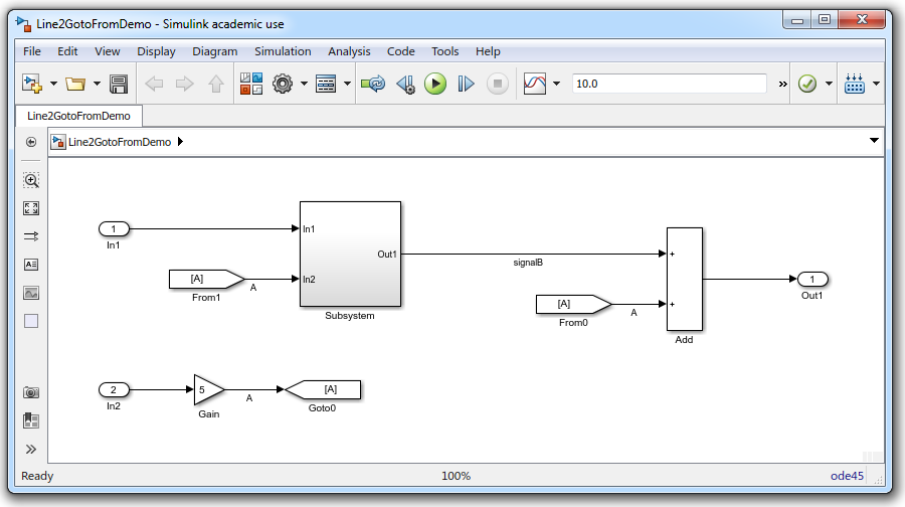

Figure 3: Line-Goto/From Tool demo model.

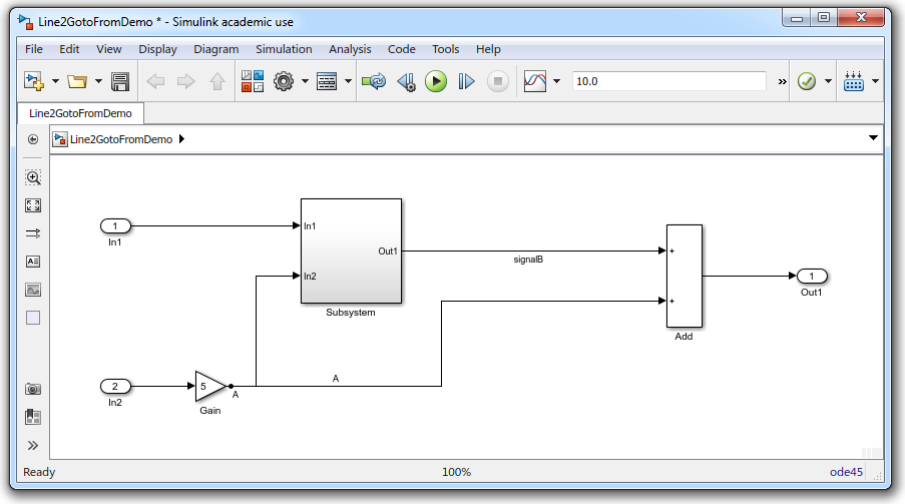

Figure 4: Resulting model after `Goto/Froms to Line` transformation on A Goto/From blocks.

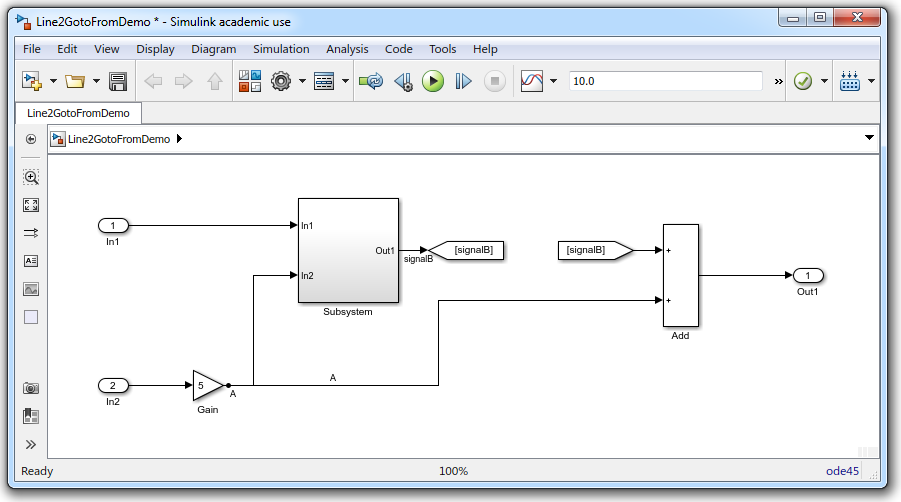

Figure 5: Resulting model after `Line to Goto/Froms` transformation on `signalB`.

4 Matlab Commands

The tool can also be used via the MATLAB command line, with the following functions.

Function	`goto2Line`
Syntax	`goto2Line`(*address, blocks*)
Description	Converts selected local Goto/From block connections into signal lines.
Inputs	*address*: Path of where the Goto/From blocks reside in the model. *blocks*: Cell array of Goto/From block pathnames or handles to convert.
Outputs	N/A

Example: The following command transforms the Goto/From blocks with tag `A`, named From0, into a signal line connection in model `Line2GotoFromDemo`. The resulting model is shown as Figure 4.

```
goto2Line('Line2GotoFromDemo', {'test2/From0'})
```

Function	`line2Goto`
Syntax	`line2Goto`(*address, line, tag*)
Description	Converts a signal line into a Goto/From connection.
Inputs	*address*: Path of where the signal line resides in the model. *line*: Handle of the signal line to convert. *tag*: Valid variable name[1] char array, to be used as the Goto/From tag.
Outputs	N/A

Example: The following command transforms the signal line named `signalB`, with line handle given as variable `lh`, into a Goto/From block connection in model `Line2GotoFromDemo`. The resulting model is shown as Figure 5.

```
line2Goto('Line2GotoFromDemo', lh, 'signalB')
```

Note: *Included with this tool are two functions,* `gcl` *and* `gcls`*, which get the current line handle(s) for one or more lines, respectively. They are provided to assist with the command line operation of this tool.*

[1] https://www.mathworks.com/help/matlab/ref/isvarname.html