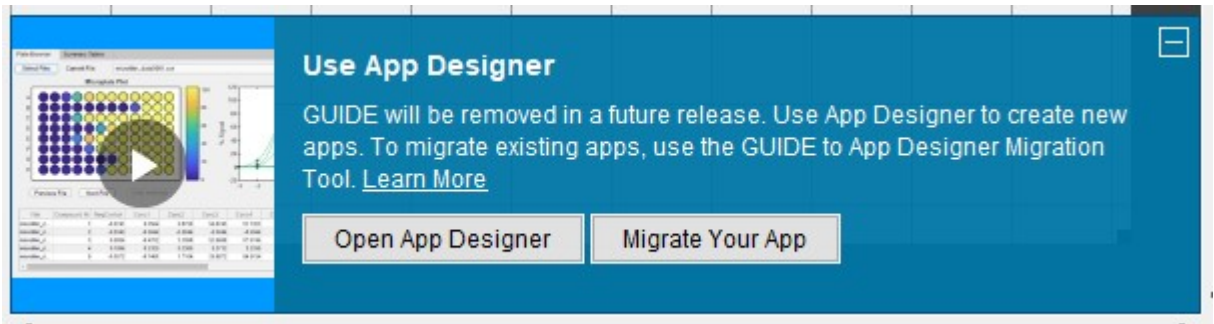


STK X Tutorial - MATLAB with GUIDE

In this exercise you will gain hands-on experience using STK X to embed STK functionality in a container application created with MATLAB with GUIDE (Graphical User Interface).

Note: For the latest versions of MATLAB that support STK 12, go to the web page help.agi.com/stk/index.htm#install/MATLABsetup.htm.

Warning: GUIDE is being deprecated by Mathworks in favor of App Designer. Support for javacomponent, JavaFrame, and actxcontrol will be discontinued in a future MATLAB release. There is currently no support for using the STK Engine Globe and Map widgets in App Designer. If you need to display the STK Engine Globe or Map widgets in MATLAB, host those controls in a separate window parented to the desktop.



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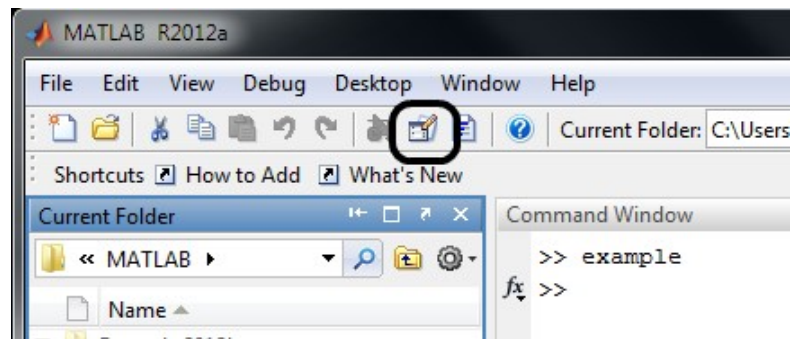
Tutorial Source Code

Completed MATLAB files can be found in the STK / STK Engine install at the following location:

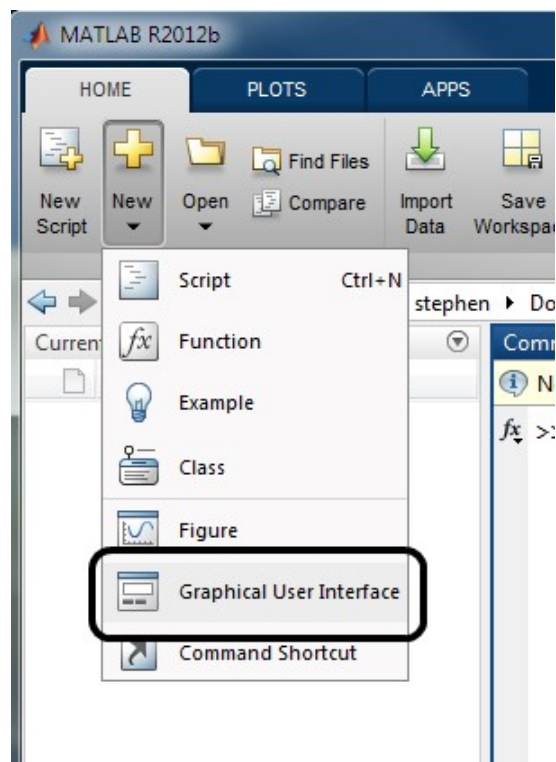
<STK Install Folder>/CodeSamples/CustomApplications/Matlab/Tutorial

Create the Project

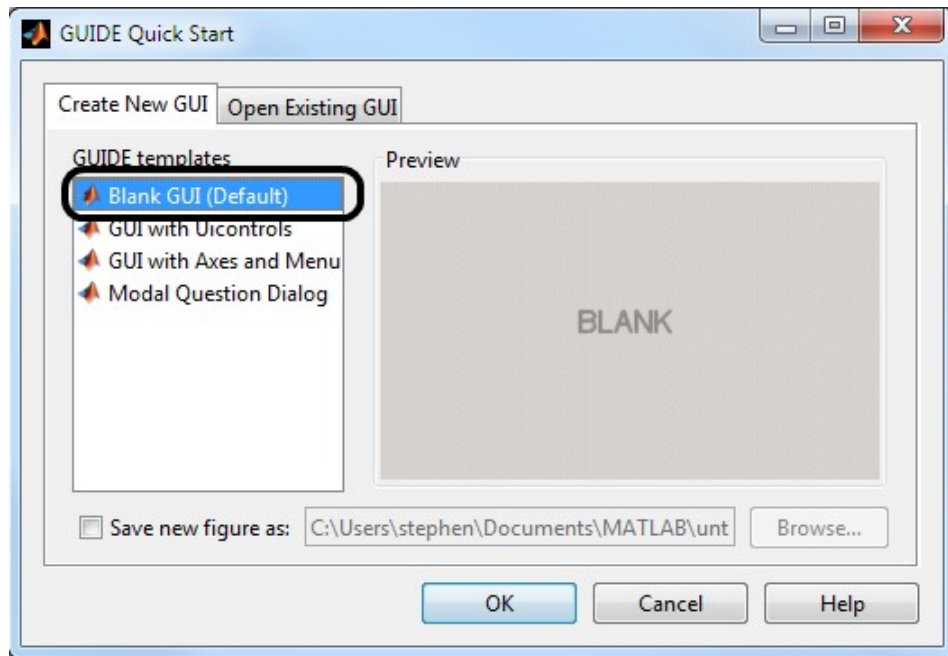
- 1) Start MATLAB
- 2) From the MATLAB main panel
 - a) In MATLAB 2012a and earlier select the **GUIDE** button to bring up the **GUIDE Quick Start** dialog:



- b) In MATLAB 2012b and later select the **Graphical User Interface** menu item under the **Home/New** button to bring up the **GUIDE Quick Start** dialog:



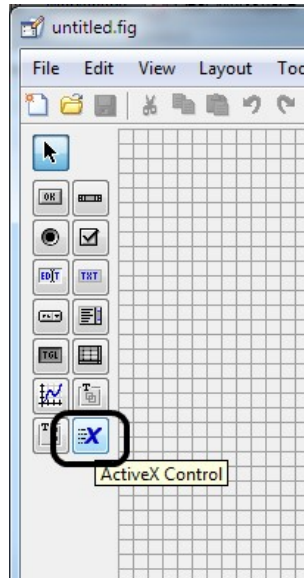
- 3) Select Blank GUI (Default) from **GUIDE Quick Start**:



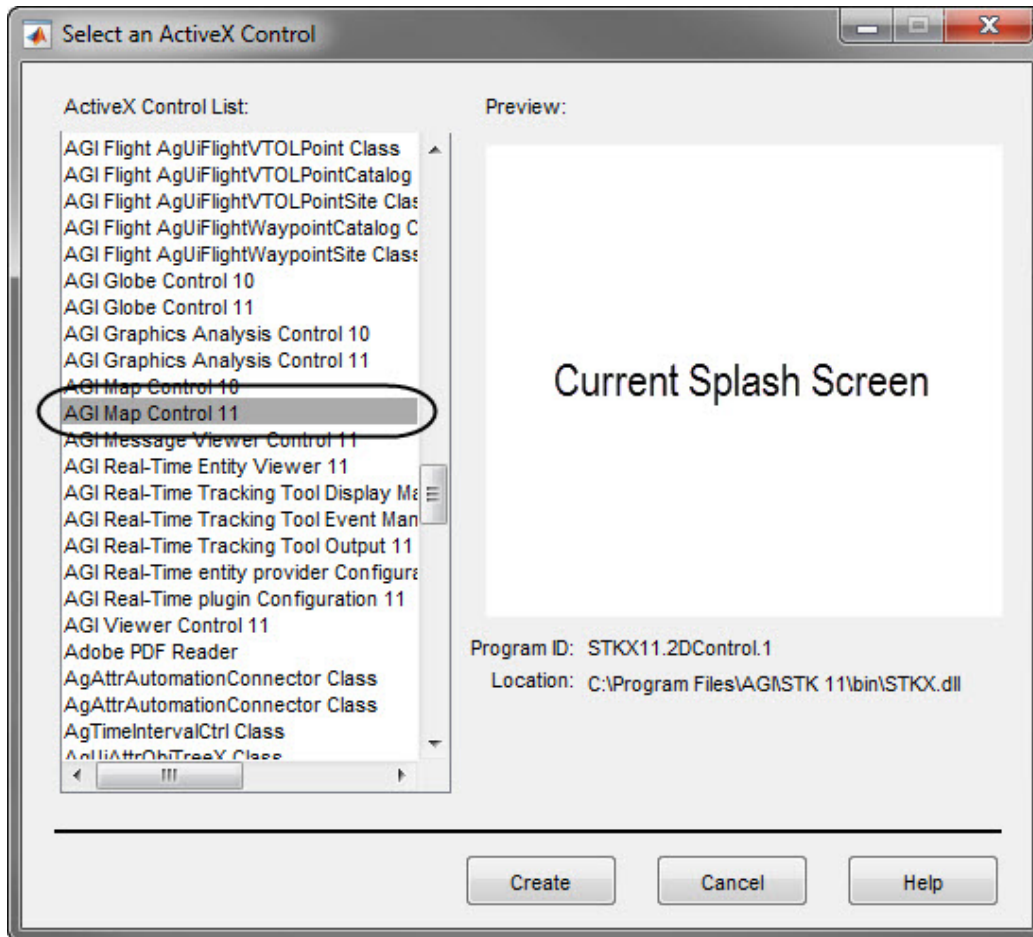
- 4) GUIDE will initialize a default form.

Add the STK X Controls to the Form

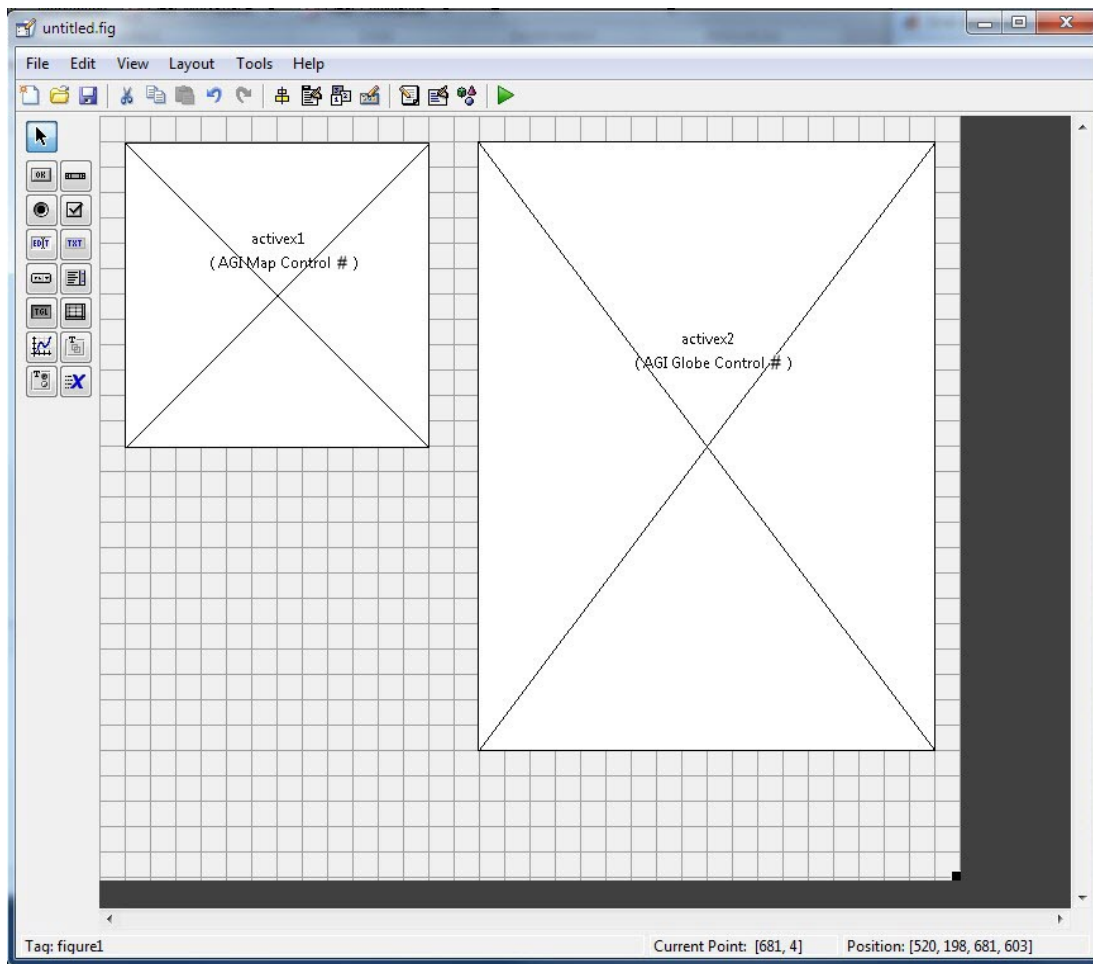
- 1) From the toolbar at the left of the GUIDE window, select the **ActiveX Control** tool.



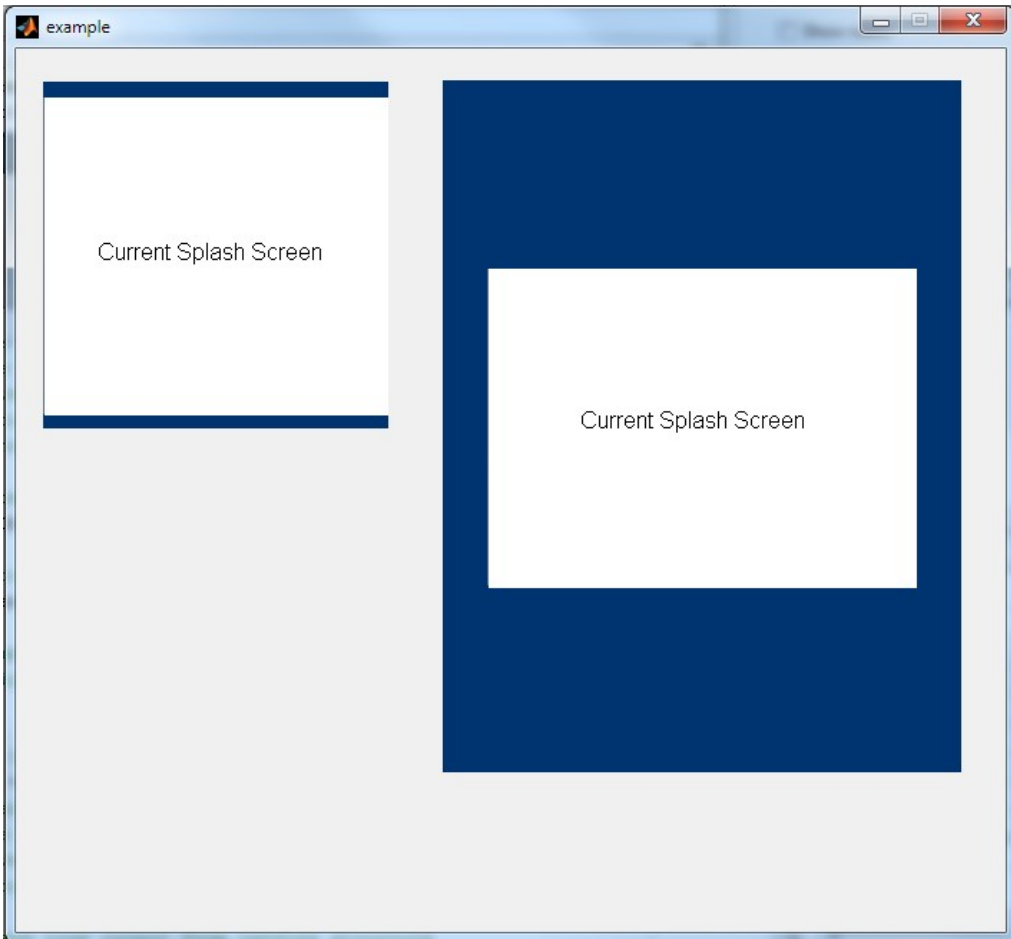
- 2) Click and drag in the form to reserve space for the Map control.
- 3) When you release the click, a dialog box will pop up to let you select which control you wish to insert. Choose AGI Map Control 11.



- 4) Click **Create** to close the **Select an ActiveX Control** dialog.
- 5) Repeat the preceding process to add an AGI Globe Control 11 to the form. You should now have two large boxes on the form: one corresponding to the Map control, and the other corresponding to the Globe control.

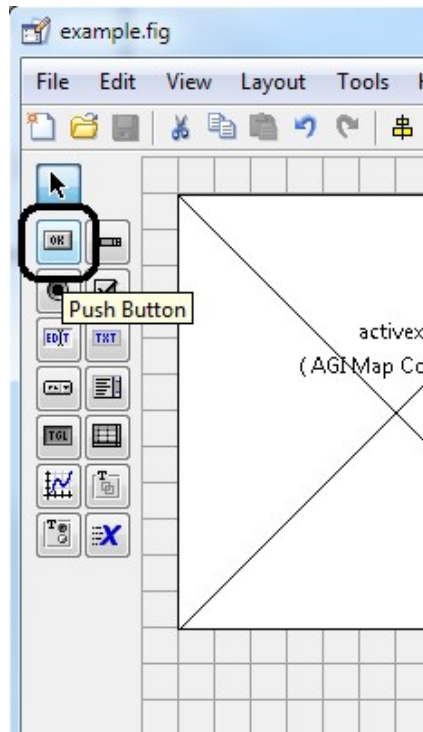


- 6) Save the form as `example.fig`. At this point, GUIDE will construct the support code to drive the form in an `.m` file corresponding to the `.fig` file of the form.
- 7) Click the **Run** button in the GUIDE toolbar to execute the form. Close the form when you are done.



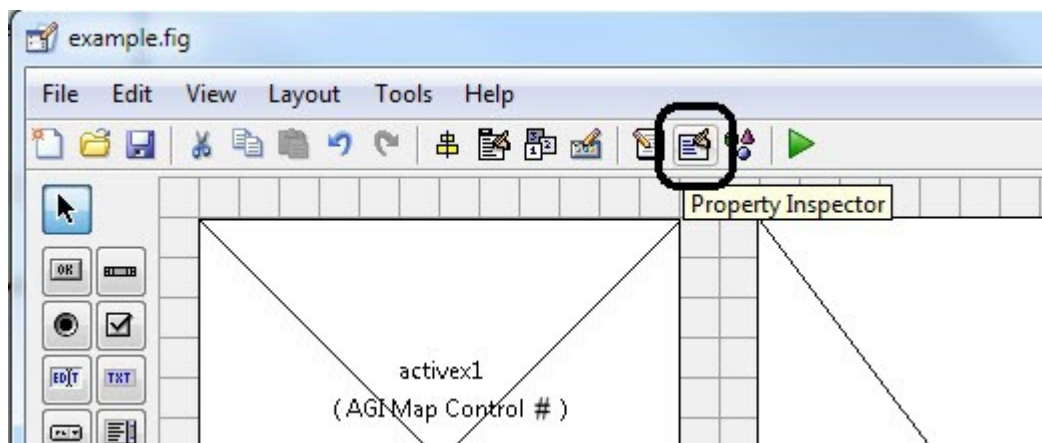
Send Commands to STK X

- 1) Close the running form. Resize the form and the ActiveX controls to a comfortable dimension. From the left-hand toolbar of the GUIDE editor, select the **Push Button** tool.

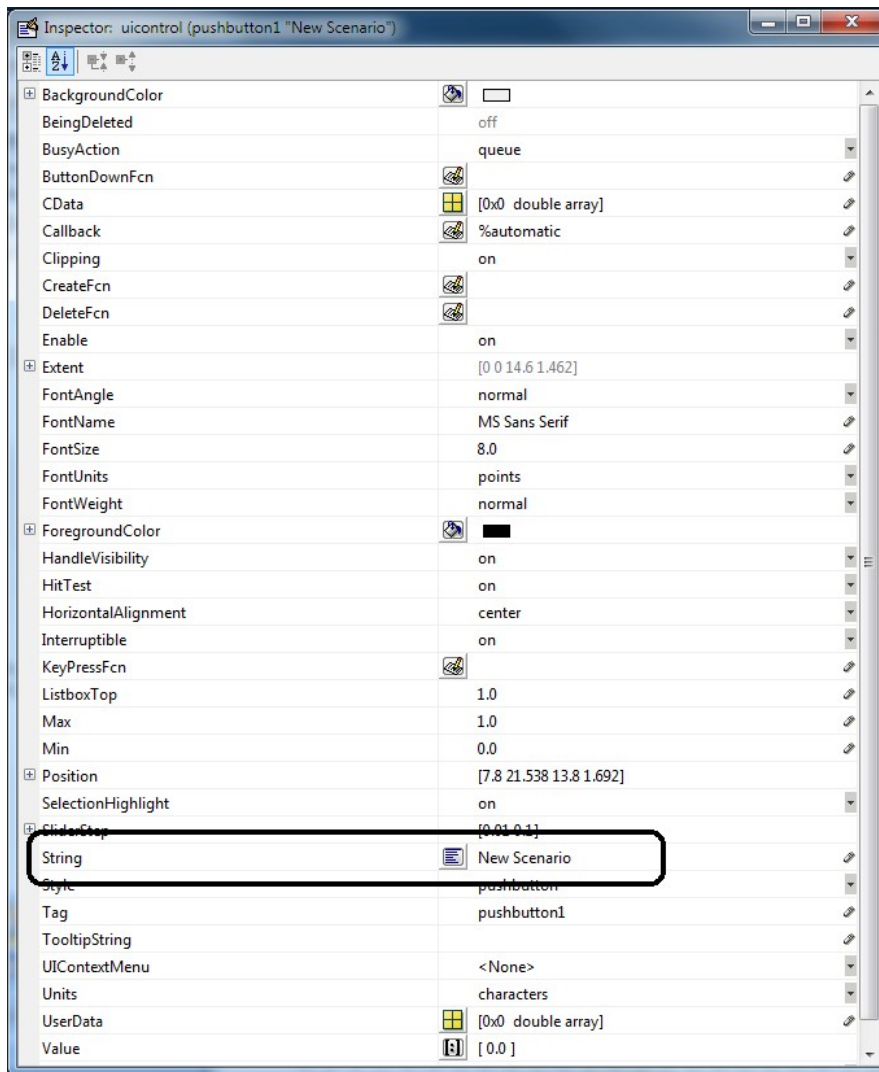


- 2) Click and drag in the form space to create a push button. Open the **Property Inspector** by clicking on the button in the top toolbar.

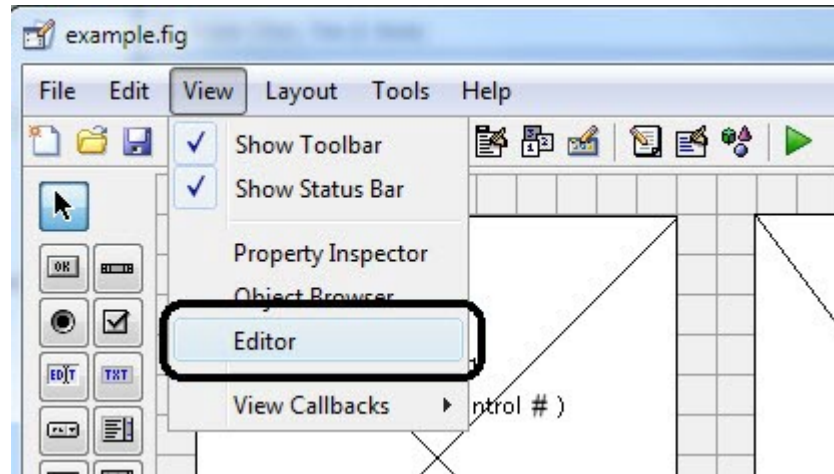
Note: You can also open the Property Inspector for a control by double clicking on it.



- 3) In the properties for the new button, change the **String** property to “New Scenario”.



4) Select m-file Editor from GUIDE's **View** menu.

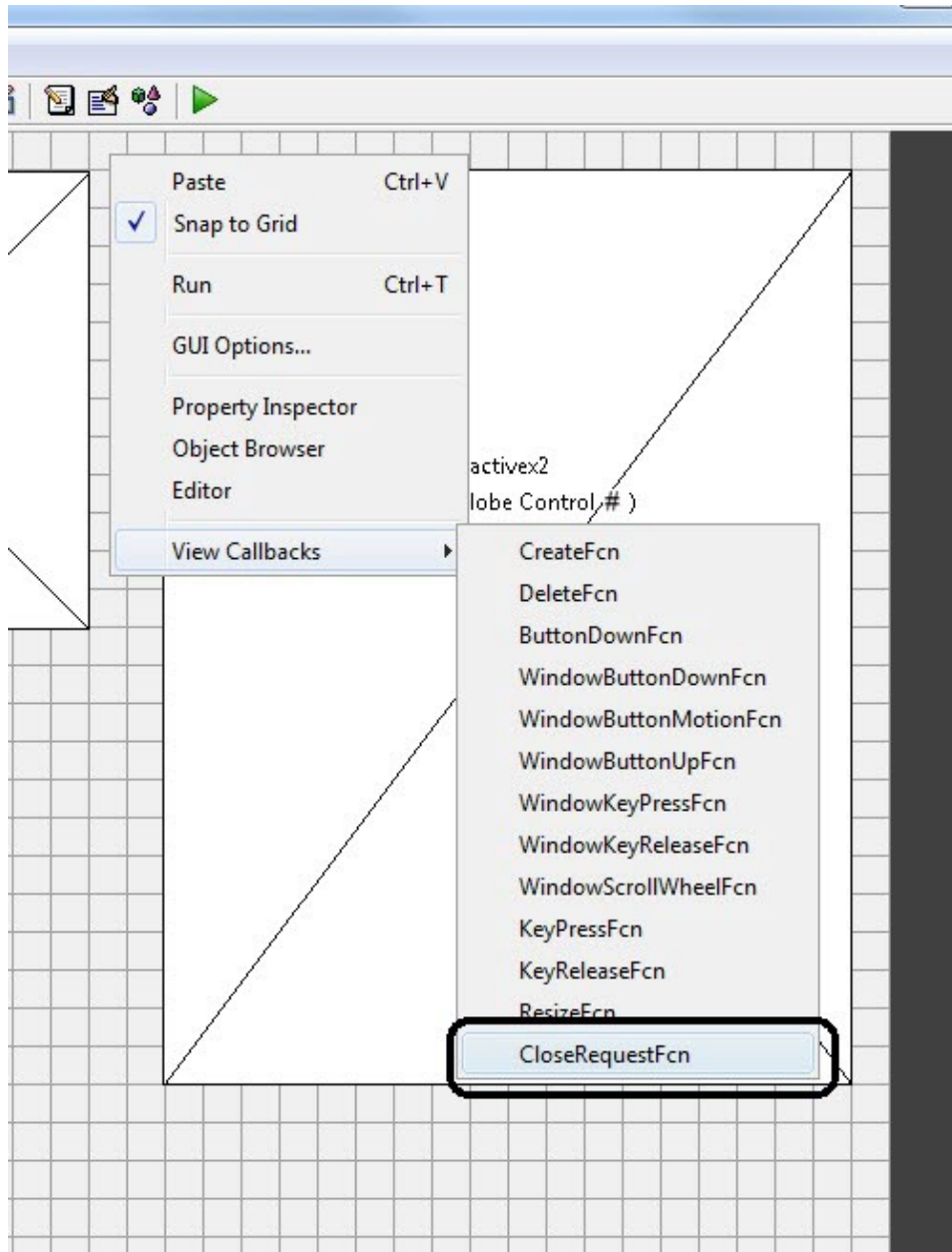


- 5) The code for the form will be displayed. Locate the `pushbutton1_Callback` function, and add the highlighted line:

```
% --- Executes on button press in pushbutton1.
function pushbutton1_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton1 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

invoke(handles.activex1.Application, 'ExecuteCommand', 'New / Scenario Test');
```

- 6) At this point, you should also add code to properly unload the scenario when the form is closed. Return to the GUIDE form editor window and right-click anywhere on the form that is not a control. Select `CloseRequestFcn` from the **View Callbacks** submenu.



- 7) The m-file editor window will display with the desired function inserted. Add the highlighted line to the function:

```

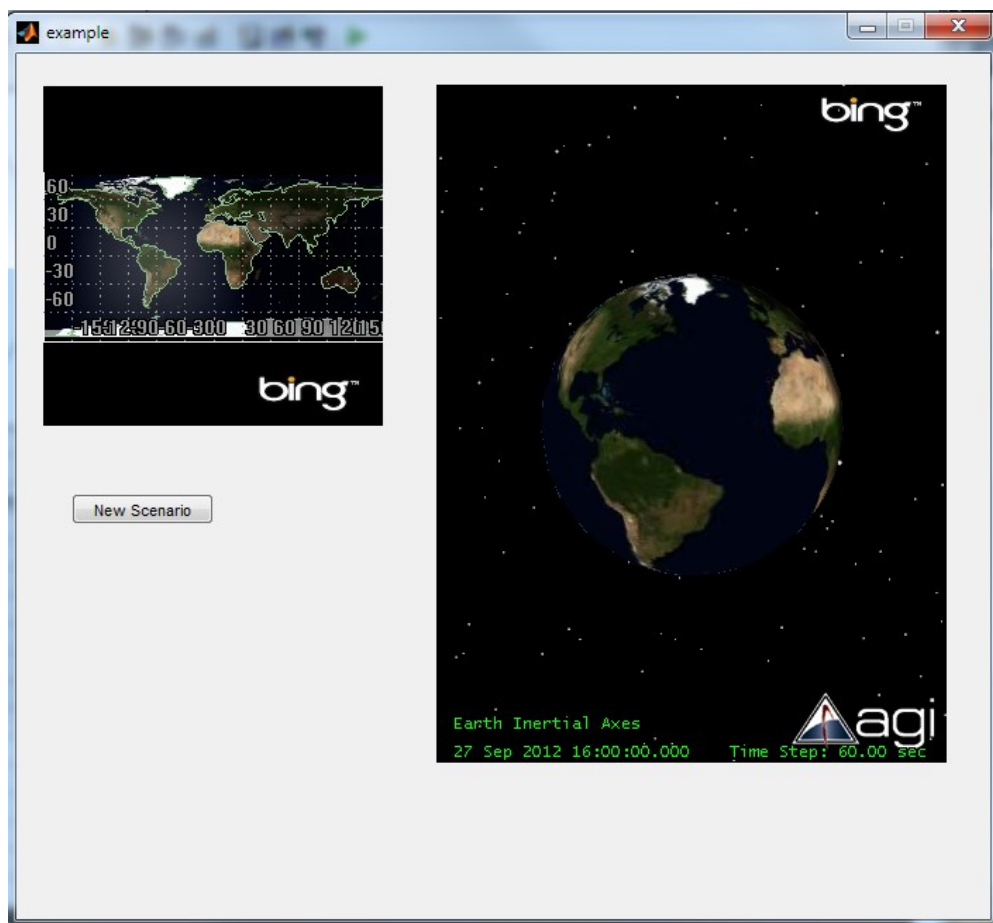
% --- Executes when user attempts to close figure1.
function figure1_CloseRequestFcn(hObject, eventdata, handles)
% hObject    handle to figure1 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

invoke(handles.activex1.Application,'ExecuteCommand','Unload / *');

% Hint: delete(hObject) closes the figure
delete(hObject);

```

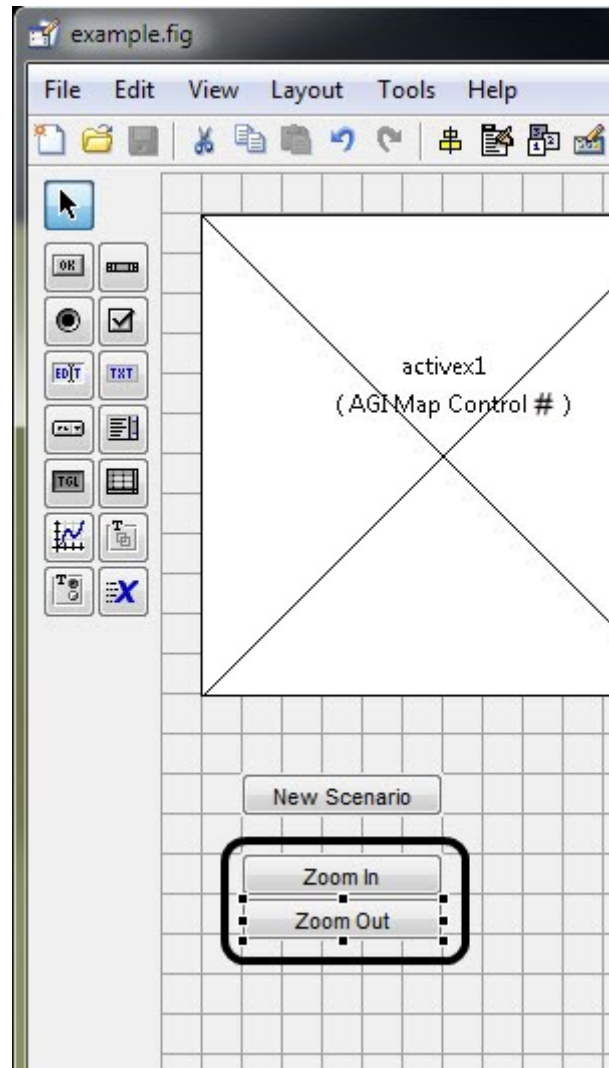
8) Run the form. Click the **New Scenario** button.



9) With the mouse you can control the Globe window.

Add Zoom In/Out to the Map Control

- 1) Add two more buttons to the **Form1** windows form. Change the **String** property for the two buttons to **Zoom In** and **Zoom Out**.



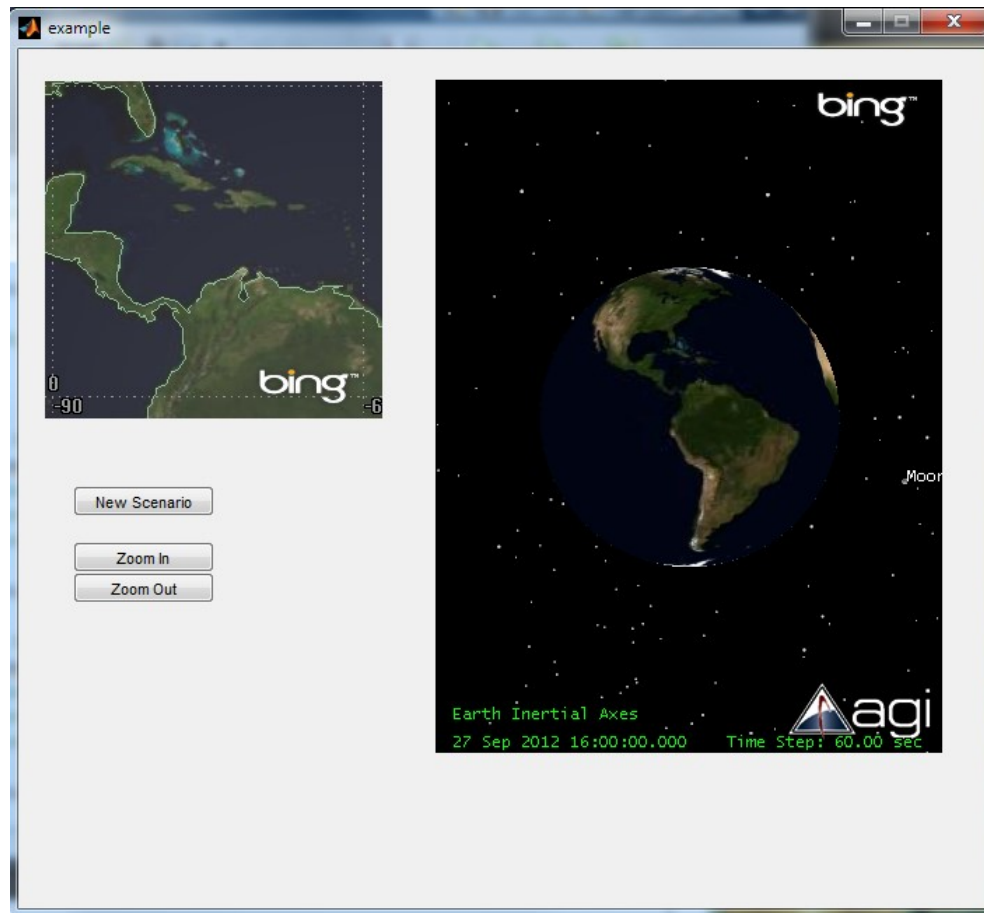
- 2) Switch to the m-file editor and locate the `pushbutton2_Callback` function. Add the following invocation to the function using the same method used for the “New Scenario” button:

```
invoke(handles.activex1, 'ZoomIn');
```

- 3) Locate the `pushbutton3_Callback` function. Add the following invocation to the function:

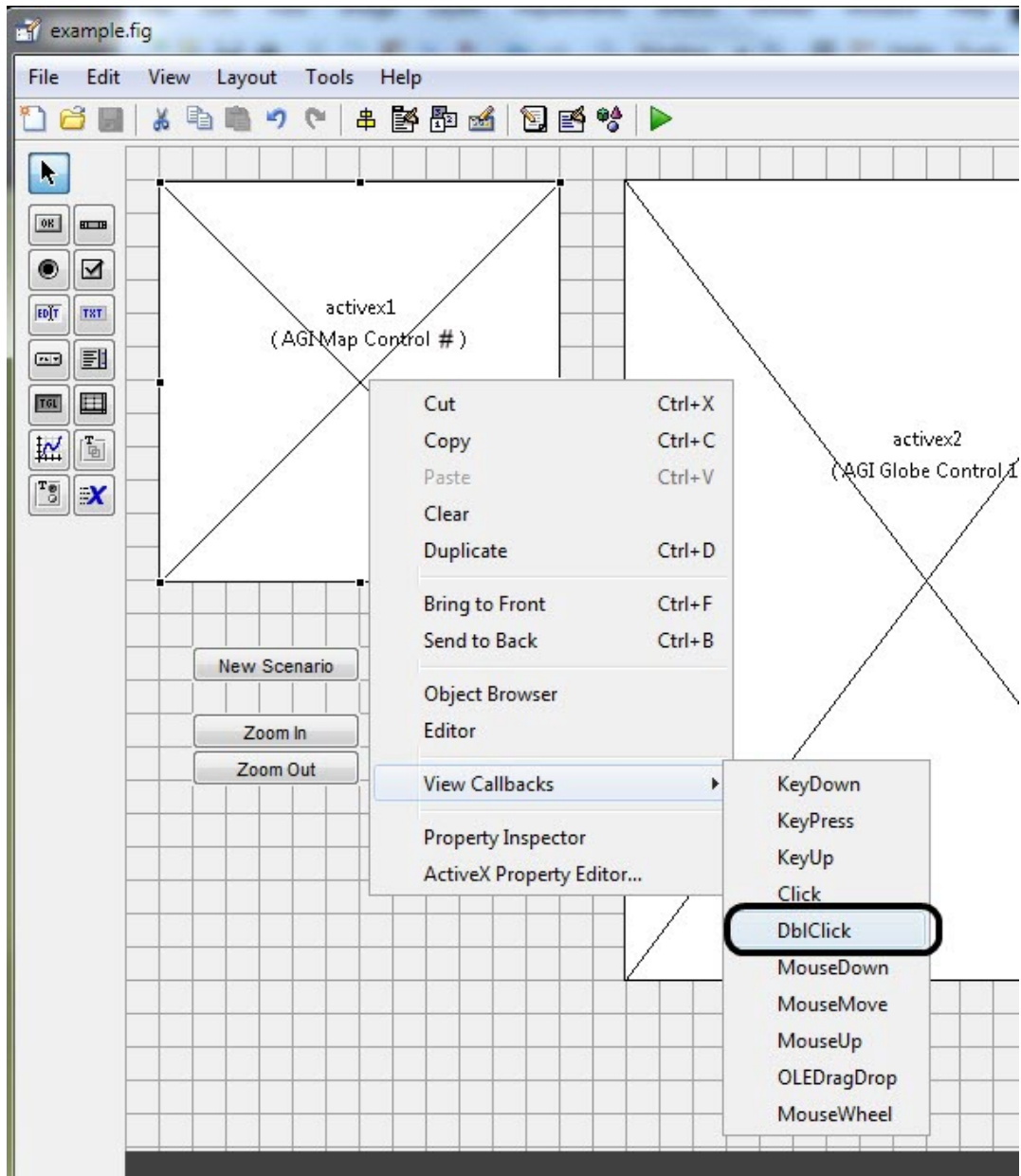
```
invoke(handles.activex1, 'ZoomOut');
```

- 4) Run the form. Click the **New Scenario** button. Click the **Zoom In** button. Use the mouse to define the zoom area in the Map control. You can zoom out by clicking the **Zoom Out** button.



Respond to Events Raised by STK X

- 1) In the GUIDE form editor, right-click on the AGI Map Control 11 control. Select `Db1Click` from the **View Callbacks** submenu.



- 2) You will be taken to the m-file editor. Add the following to the `activex1_DblClick` function:

```
disp('LOG MESSAGE: agi Map Control double-clicked.');
```

- 3) Run the form, and double-click the Map window. The above string will be displayed in the main MATLAB console window.

```

Command Window

>> example

ans =

    Interface.AGI_STK_Util_11.IAgExecCmdResult

LOG MESSAGE: agi Map Control double-click.

ans =

    Interface.AGI_STK_Util_11.IAgExecCmdResult

fx >>

```

- 4) You can use the same approach to hook up to the VO control events.
- 5) You are now going to respond to STK X application events. In the m-file editor, locate the `example_OpeningFcn` function. Add the lines in bold to the function definition:

```

% --- Executes just before example is made visible.
function example_OpeningFcn(hObject, eventdata, handles, varargin)
% This function has no output args, see OutputFcn.
% hObject    handle to figure
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% varargin   command line arguments to example (see VARARGIN)

% Choose default command line output for example
handles.output = hObject;

% Update handles structure
guidata(hObject, handles);

global EXAMPLE_APP;

% obtain a handle to the application
EXAMPLE_APP = actxserver('STKX11.Application');

% register the app callback
EXAMPLE_APP.registerevent({'onScenarioNew' 'stkapp_catch_scenario_new'});

```

- 6) Locate the `figure1_CloseRequestFcn` and add the highlighted lines:


```

% --- Executes when user attempts to close figure1.
function figure1_CloseRequestFcn(hObject, eventdata, handles)
% hObject    handle to figure1 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

invoke(handles.activex1.Application,'ExecuteCommand','Unload / *');

global EXAMPLE_APP;

release(EXAMPLE_APP);
EXAMPLE_APP=0;

% Hint: delete(hObject) closes the figure
delete(hObject);

```

- 7) Create a new m-file by selecting **New** from the m-file Editor menu. In the file, add the following handler function:

```

%handles scenario new events in the example program
function stkapp_catch_scenario_new(varargin)

global EXAMPLE_APP;

disp('New Scenario created. ');
disp(varargin{3});

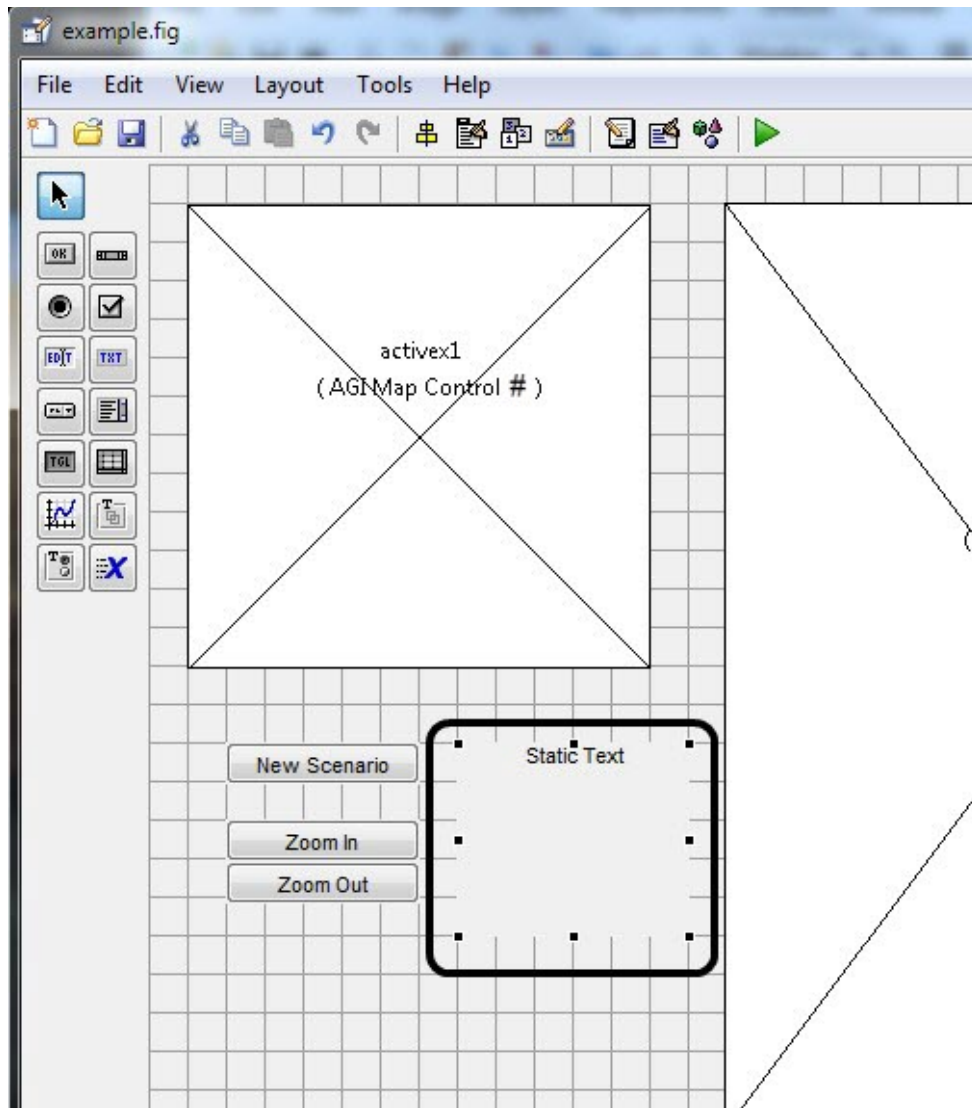
```

NOTE: For more information on the format of the varargin string array, see the MATLAB documentation "Writing Event Handlers :: COM and DDE Support (External Interfaces)."

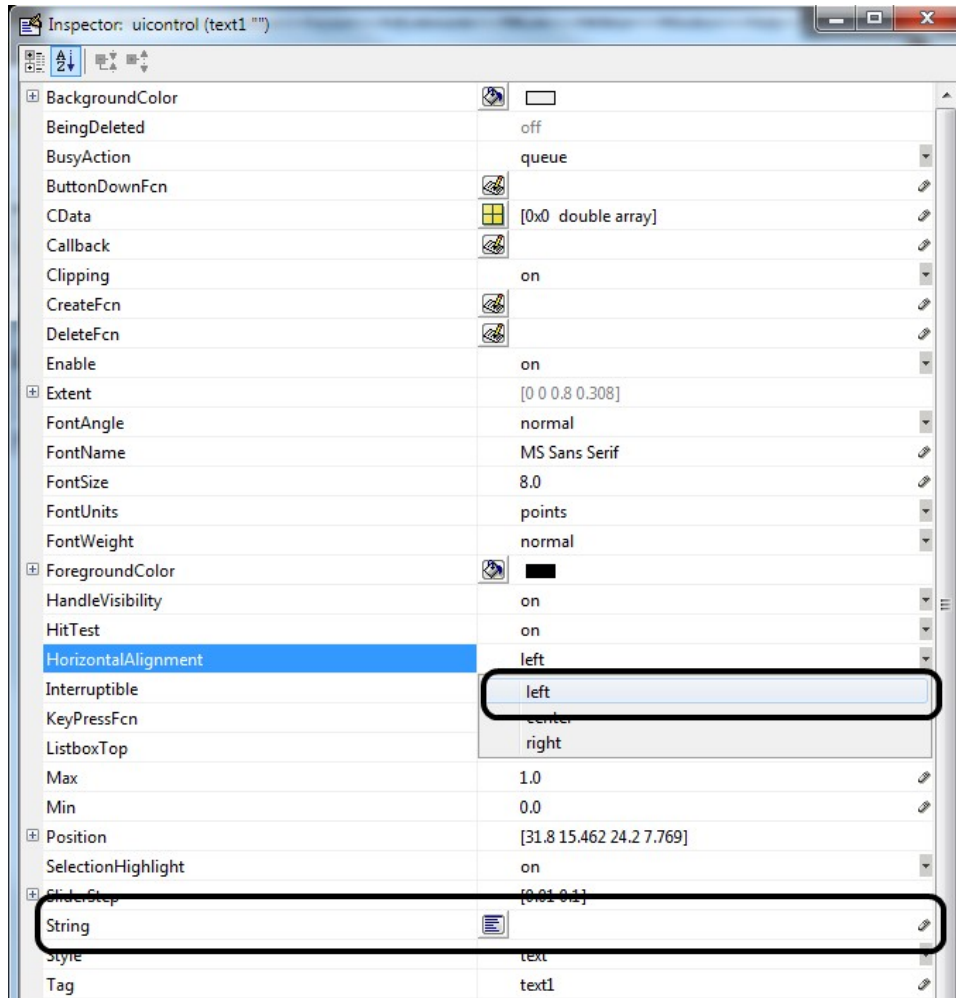
- 8) Save the m-file you have created as `stkapp_catch_scenario_new.m`, and then return to the GUIDE form editor and run the form. When you click the **New Scenario** button, you will see a message appear in the main MATLAB window describing the file path of the scenario created.

Add Map Picking

- 1) Return to the GUIDE form designer. From the toolbar on the left, select a **Static Text** object and insert it in the form.



- 2) Double-click on the label to bring up the properties window. Delete the contents of the **String** property to clear the label and set the **HorizontalAlignment** property to left.



- 3) Right-click on the AGI Globe Control control and select `MouseMove` from the **View Callbacks** submenu. Insert the following code into the function:

```

global EXAMPLE_APP;

pickInfo = handles.activex2.PickInfo(eventdata.X,eventdata.Y);

if pickInfo.isLatLonAltValid()

    crlf=[13,10];

    labelstring=['Lat: ',num2str(pickInfo.lat),crlf,'Lon: ',num2str(pickInfo.lon)];

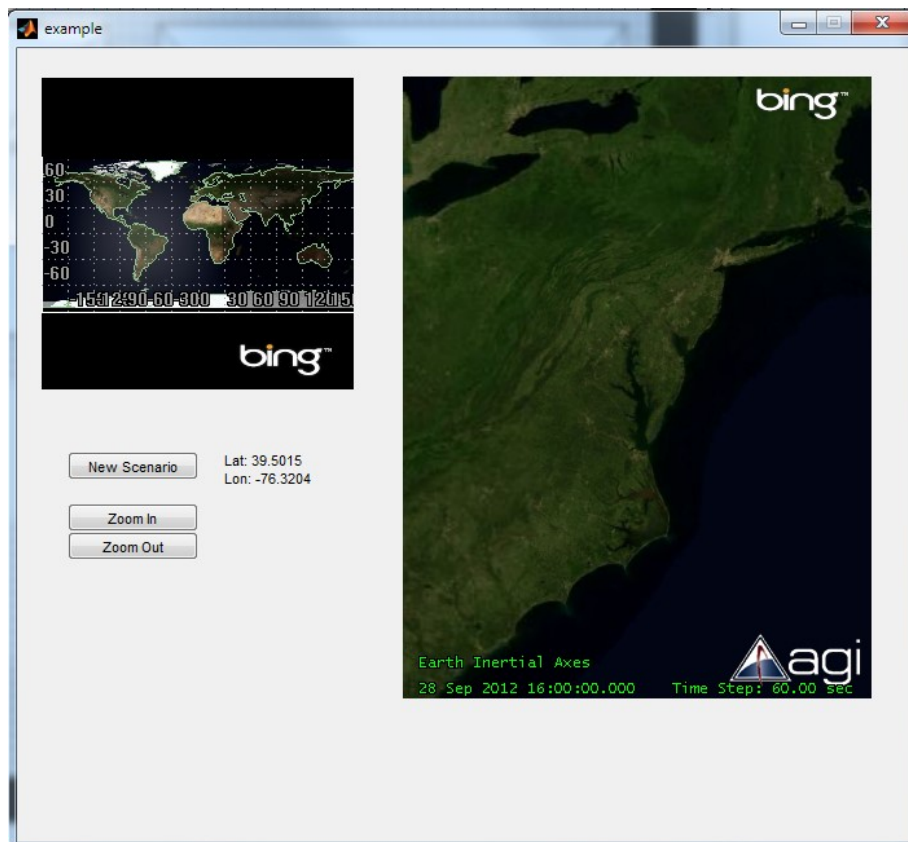
    set(handles.text1,'String',labelstring);

else
    set(handles.text1,'String','');
end

release(pickInfo);

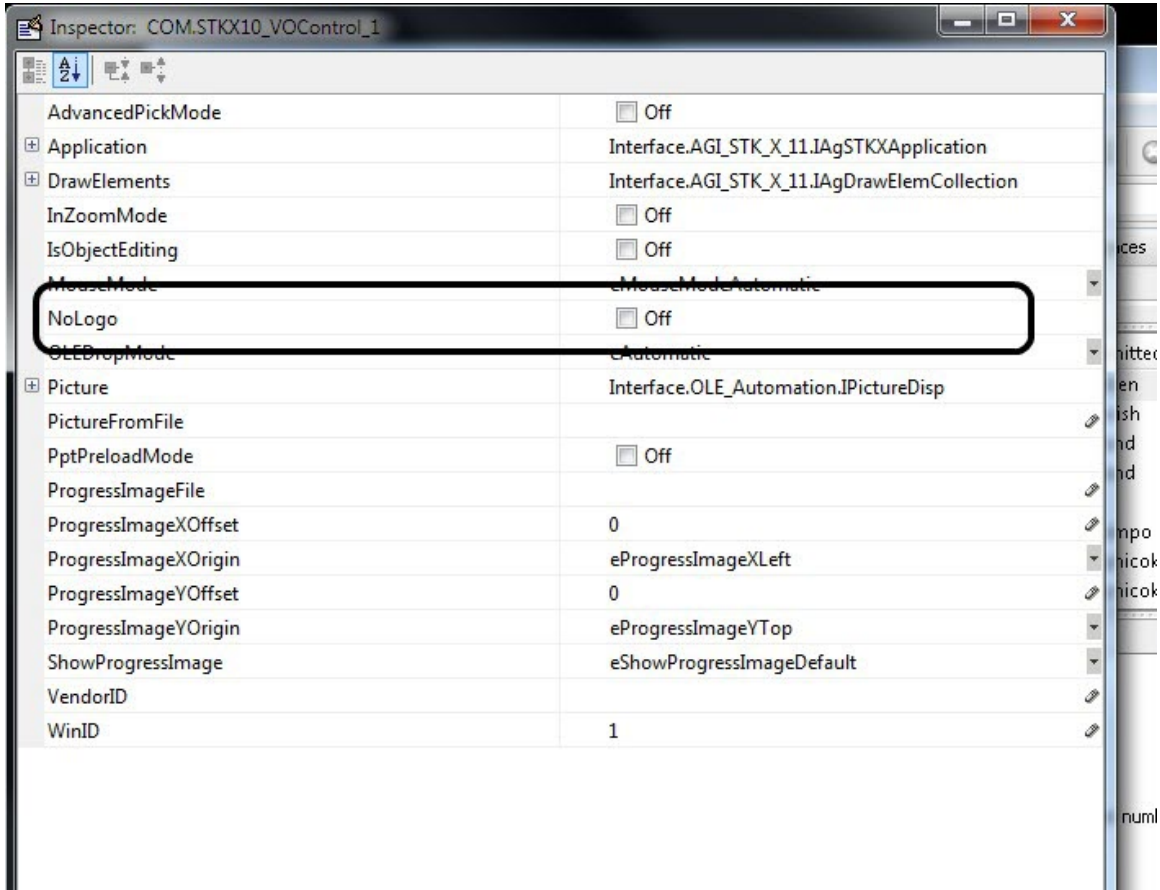
```

- 4) Run the form. Click the **New Scenario** button. Move the mouse over the globe in the Globe control. The mouse move event will be called. The mouse coordinates are converted to latitude/longitude and displayed in the label.



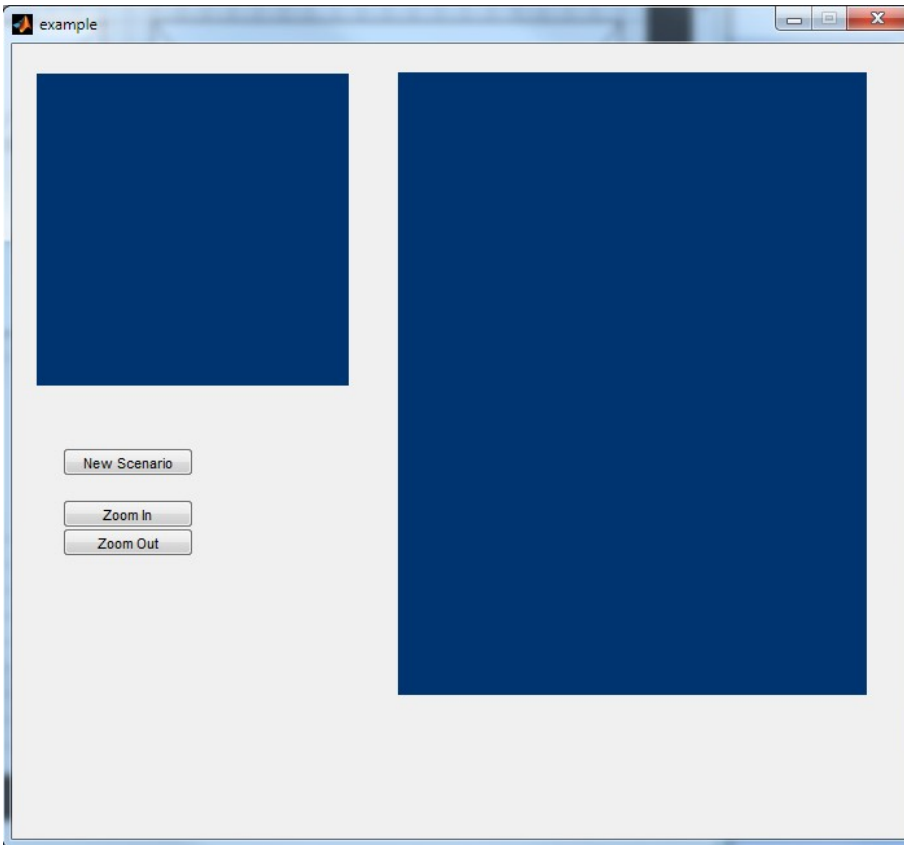
Set STK X Properties

- 1) Return to the GUIDE form editor. Double-click on the Globe object to bring up the **Property Inspector**.



Here you can see some of the additional properties that the Globe control understands. For example, if you don't want to display the STK X splash logo check the Off checkbox for the NoLogo property. Try this now: check the NoLogo Off checkbox, and run the form.

Note: In the image below both the Map and Globe controls for NoLogo are set to Off.



- 2) Close the example, and return to the **Property Inspector** and uncheck the NoLogo Off checkbox.

There are two additional properties you can access that do not appear in the **Property Inspector**. The first is the Picture property (see the MATLAB documentation on ActiveX embedding for more information on setting this property). The second is the background color of the control.

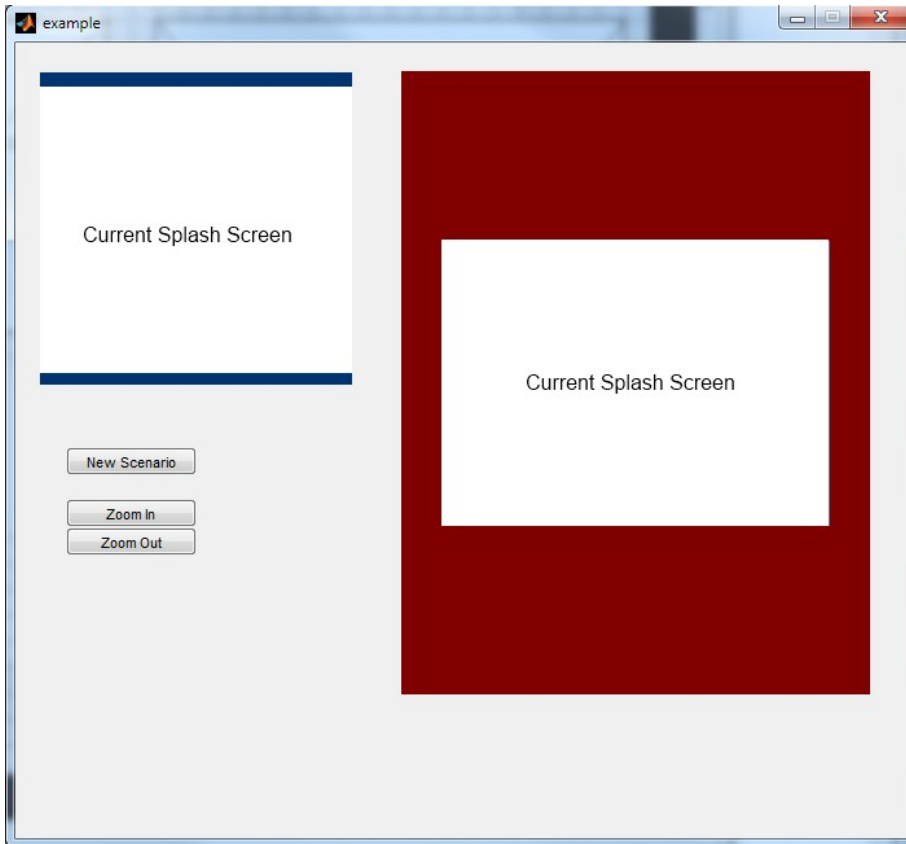
- 3) Open the form's m-file and locate the `example_OpeningFcn` function. Find the following lines near the end of the function:

```
% register the app callback
EXAMPLE_APP.registerevent({'onScenarioNew' 'stkapp_catch_scenario_new'});
```

- 4) After the above lines, add the following:

```
% set background color of VO control
% OLE colors are blue, green, red two-byte values. Each value can
% therefore from 0 to 255
bgcolorRed = 128;
bgcolorGreen = 0;
bgcolorBlue = 0;
bgcolor = (bgcolorBlue * 256^2) + (bgcolorGreen * 256^1) + (bgcolorRed * 256^0);
set(handles.activex2, 'Backcolor', bgcolor);
```

- 5) Run the form. The initialization code you have added will set the Globe control background to dark red.



Add Connect Command Interface

Note: This exercise is optional, you only need this if you want your application to accept Connect commands.

Note: If you are running on Windows Vista or later you may be required provide administrator permissions when running the form.

Open the form's m-file and locate the `example_OpeningFcn` function. Find the following lines near the end of the function:

```
bgcolorBlue = 0;  
bgcolor = (bgcolorBlue * 256^2) + (bgcolorGreen * 256^1) + (bgcolorRed * 256^0);  
set(handles.activex2, 'Backcolor', bgcolor);
```

After the above lines, add the following:

```
% Enables the connect command interface  
set(EXAMPLE_APP, 'EnableConnect', true);  
set(EXAMPLE_APP, 'ConnectPort', 5001);
```

Run the form. Your application is ready to accept Connect commands now.