Matlab GUIs

Brief Description for EIT_fem

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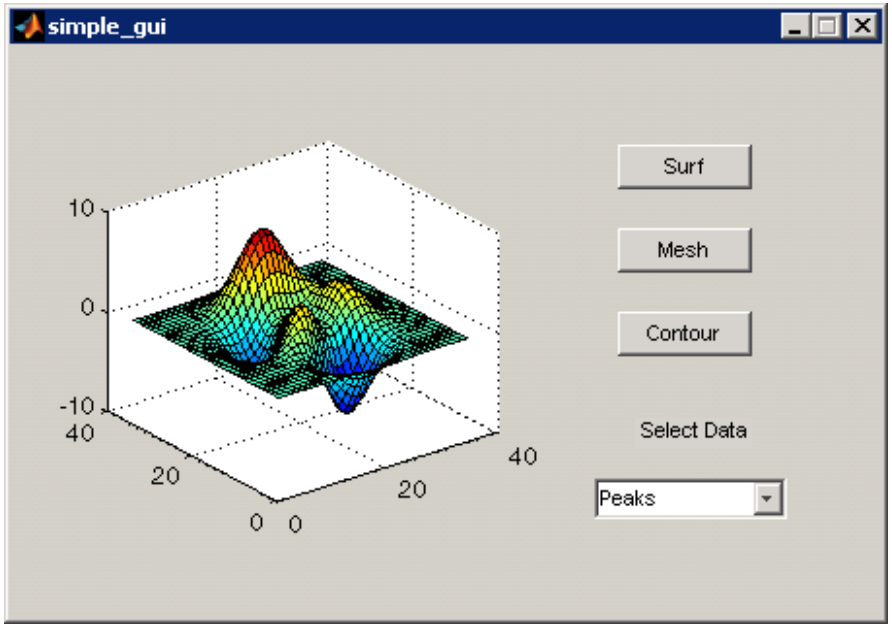
What Is a GUI?

- GUI : Graphical User Interface
  - ✓ a graphical display in one or more windows containing controls, called *components*, that enable a user to perform interactive tasks.

- GUI components can include
  - ✓ menus, toolbars,
  - ✓ push buttons, radio buttons, list boxes, and sliders

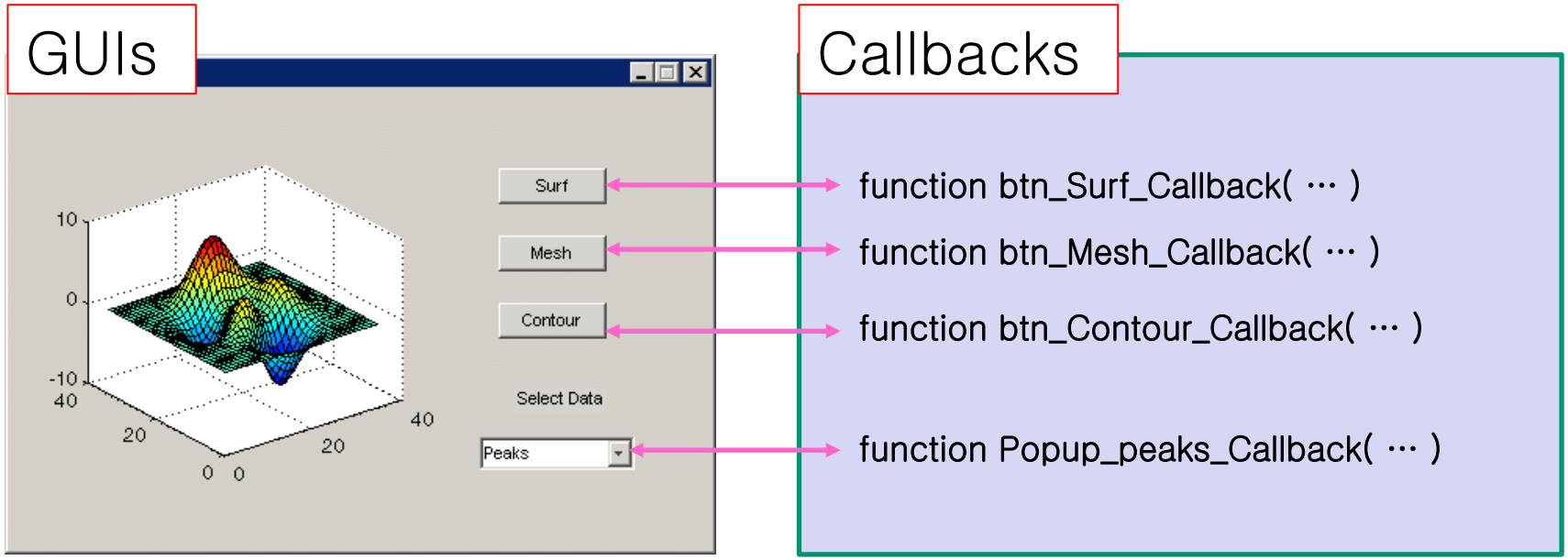
- GUIs can also perform
  - ✓ read and write data files,
  - ✓ communicate with other GUIs,
  - ✓ display data as tables or as plots



How Does a GUI Work?

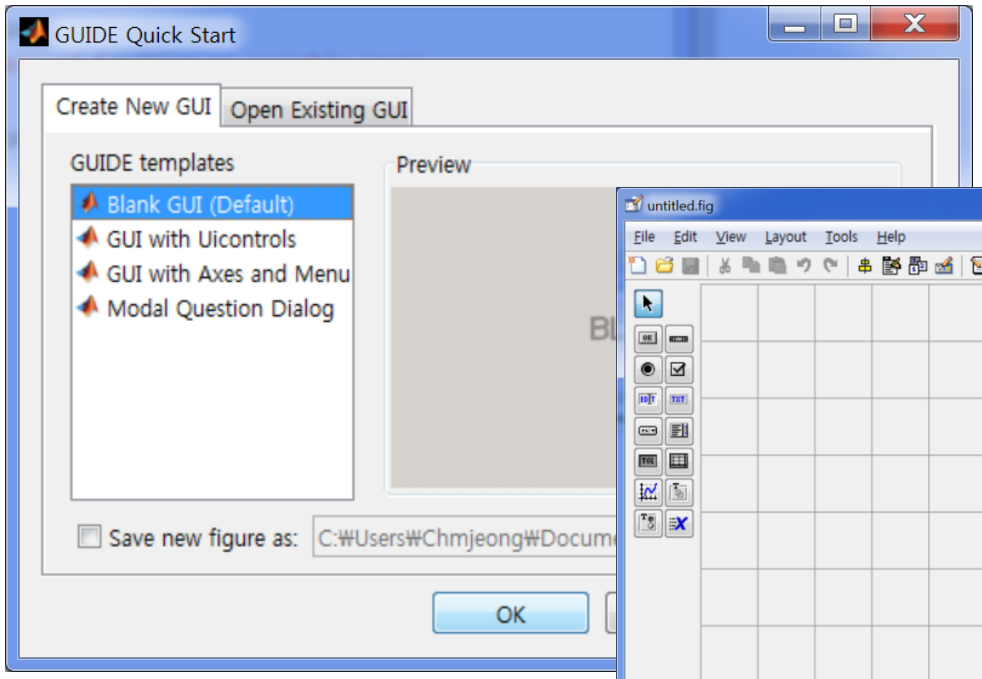
- GUIs wait
  - ✓ for an end user to manipulate a control,
  - ✓ and then respond to each user action in turn.

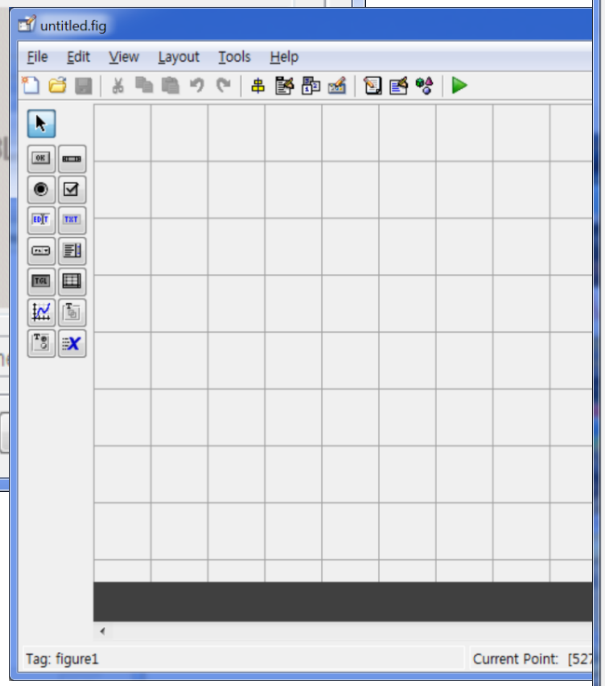
- In event-driven programming,
  - ✓ callback execution is asynchronous, that is, events(user interactions) external to the software trigger callback execution.

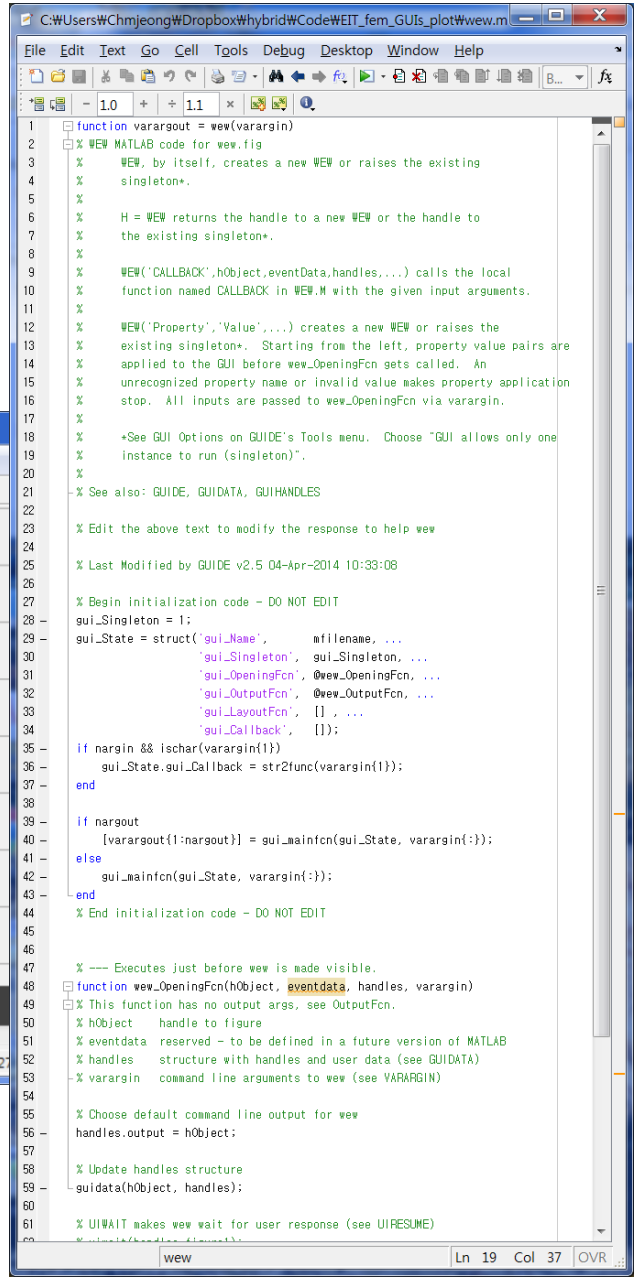


Create Blank GUI

❖ File>New>GUI



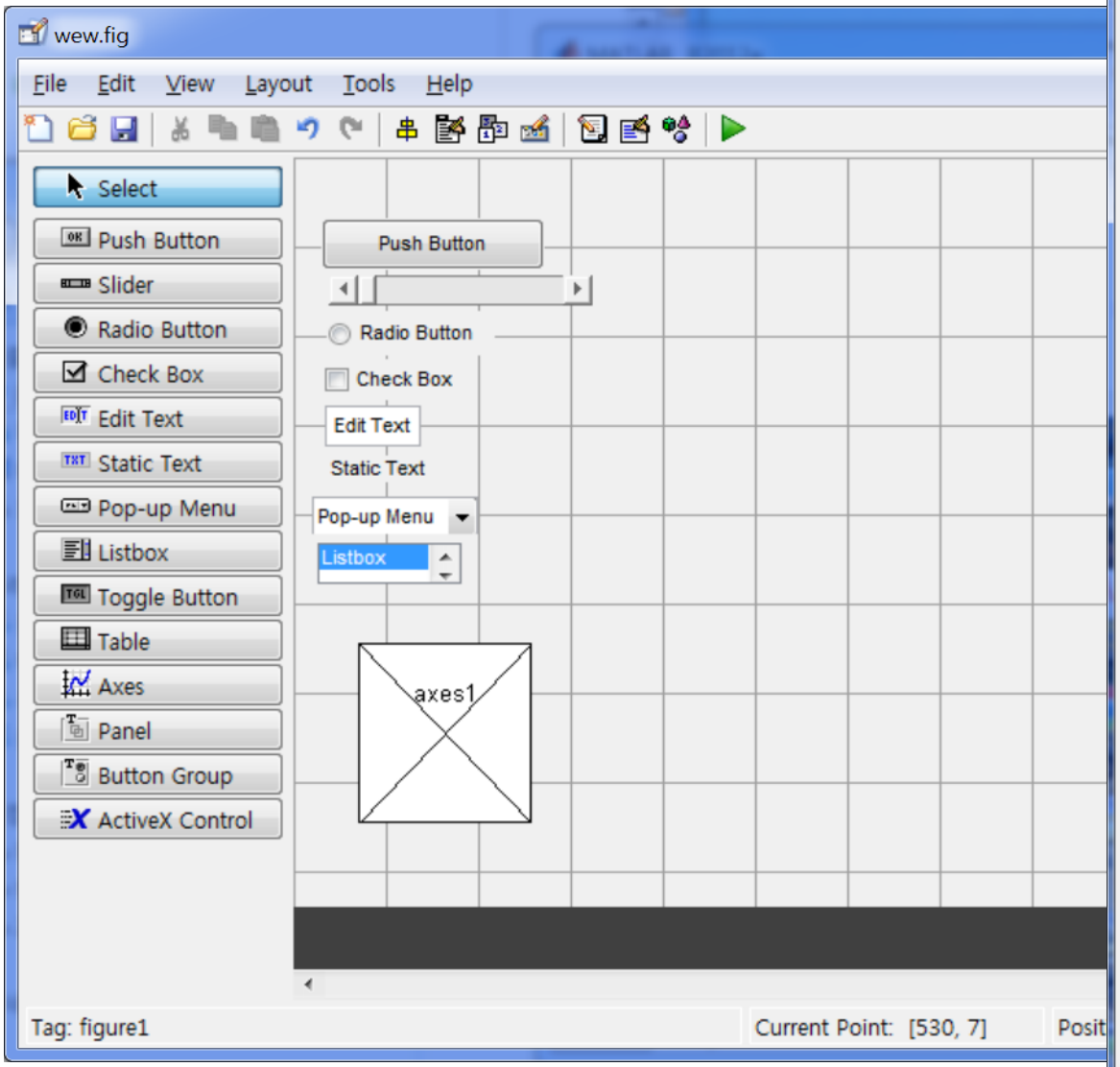


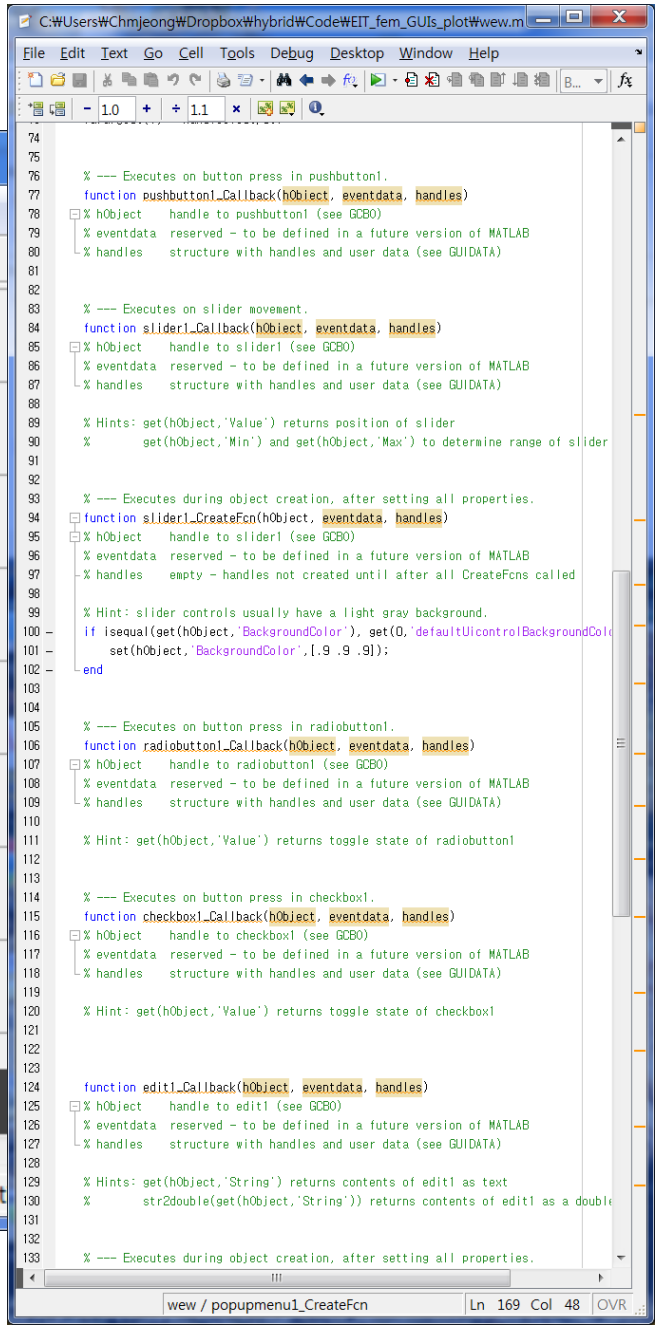


❖ Save the files

- ✓ xxx.fig → figure file
- ✓ xxx.m → callback file(control code)

Components of GUIs





❖ File>Preferences : Click “Show names in component palette”

Handles structure

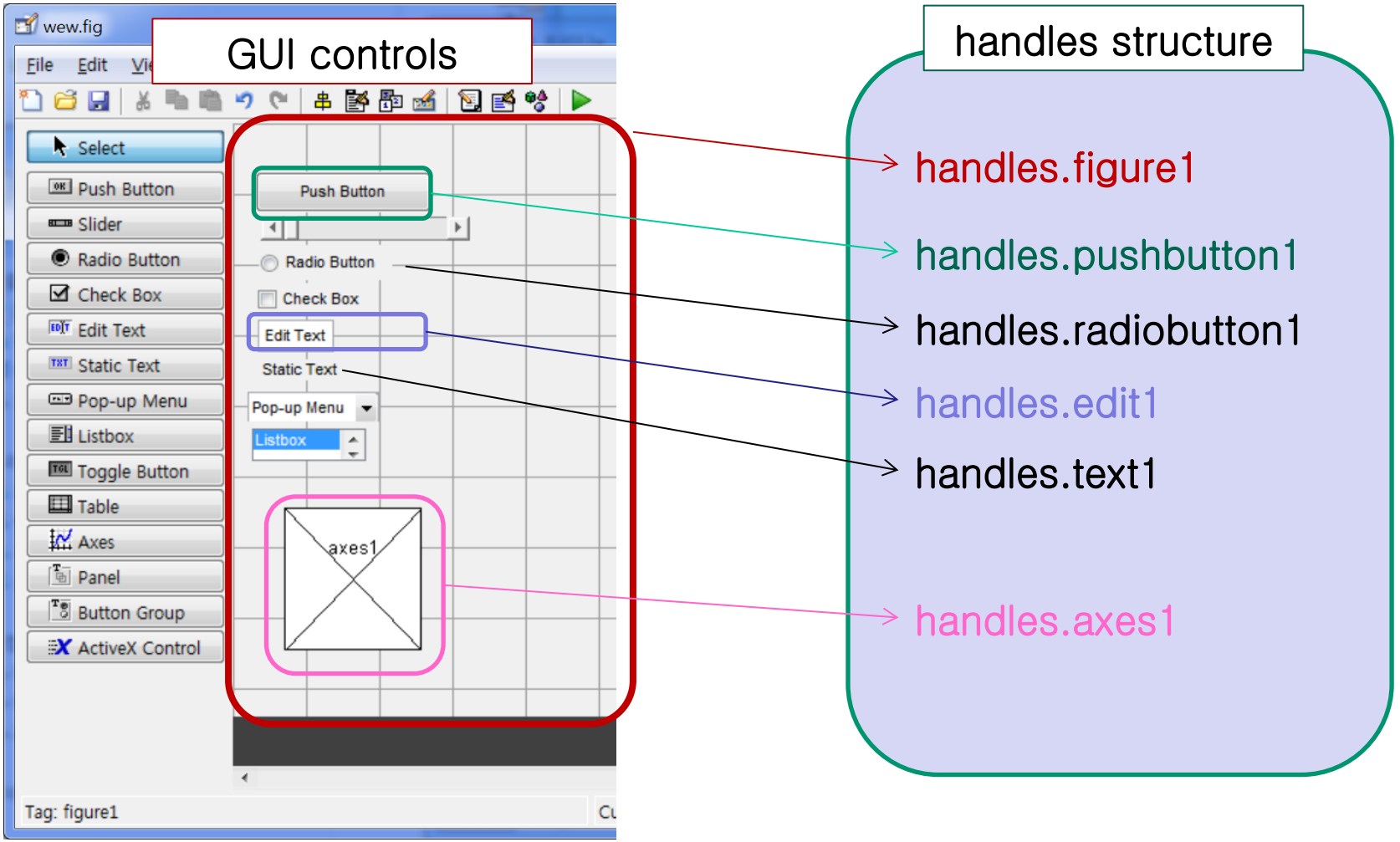
- All functions in the M-file have the following input arguments corresponding to the handles structure:
  - ✓ hObject -- the handle to the figure or Callback object
  - ✓ eventdata -- input from keyboard or mouse click to do something
  - ✓ handles -- structure with handles and user data

  - ✓ function test_OpeningFcn(hObject, eventdata, handles, varargin)

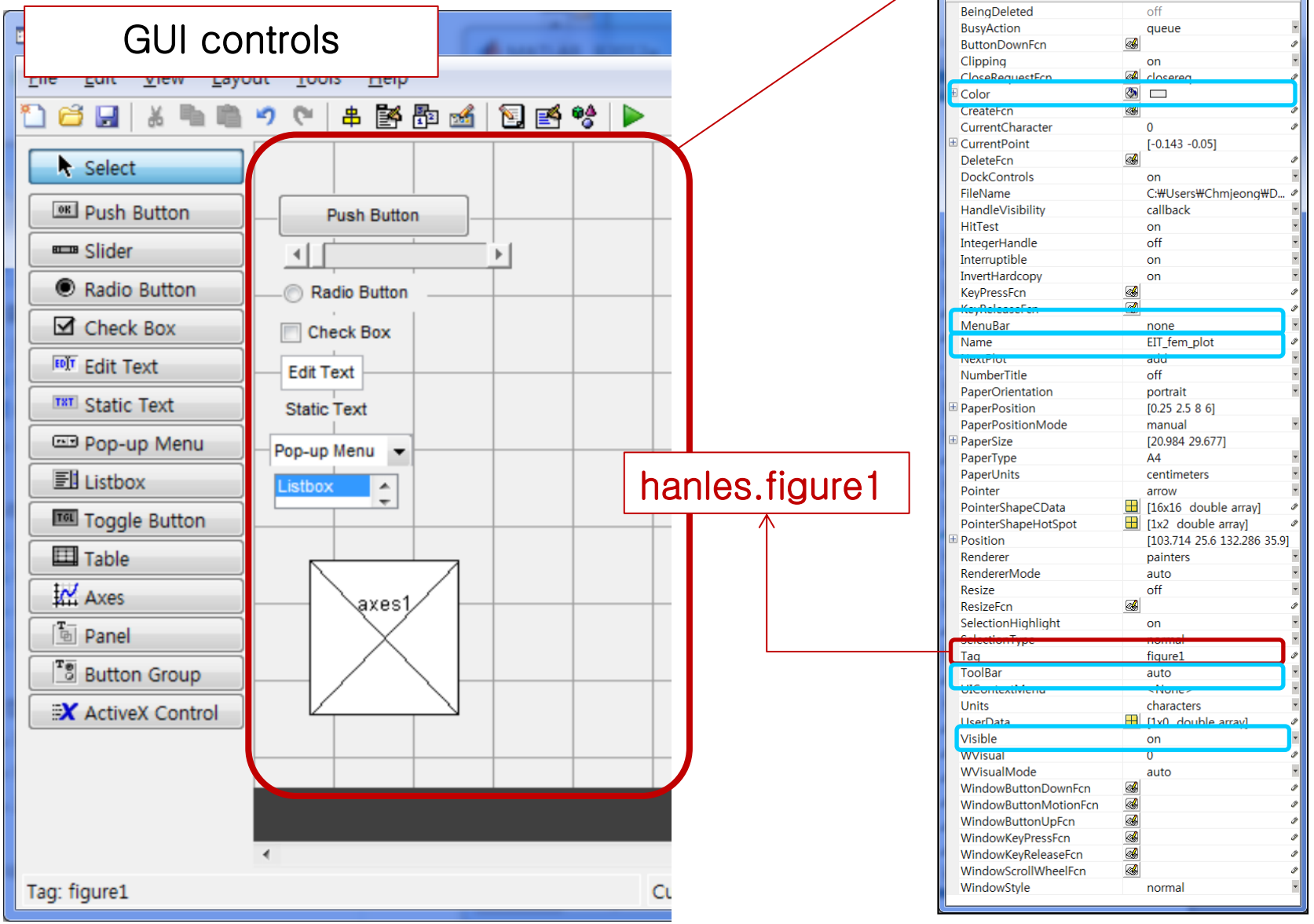
- Update of the handles structure
  - ✓ guidata(hObject, handles);

Handles structure

- handle : identification of objects in GUI
  - ✓ Assign to a real value

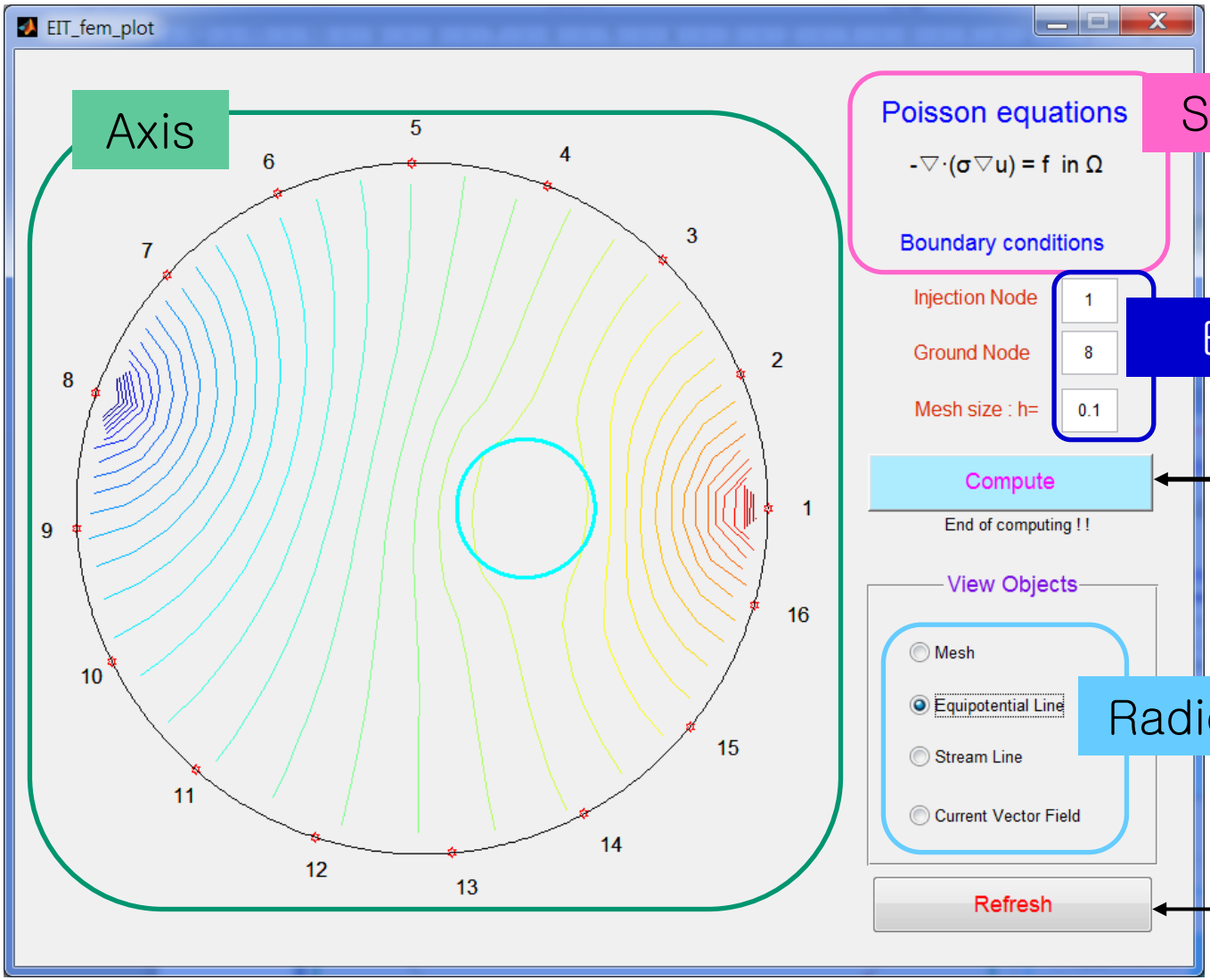


Inspector : figure

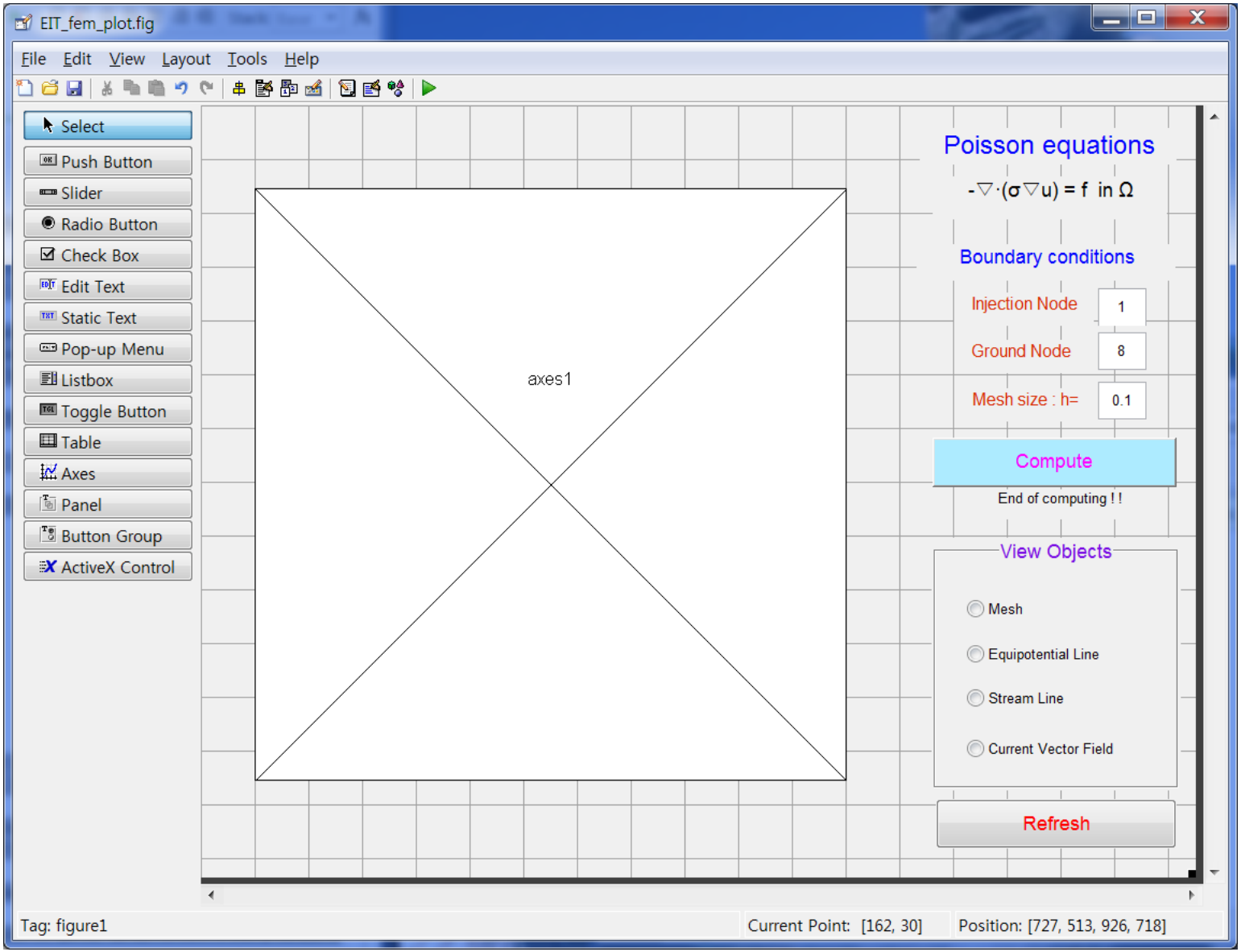


Planning of GUIs

EIT_fem_plot.exe

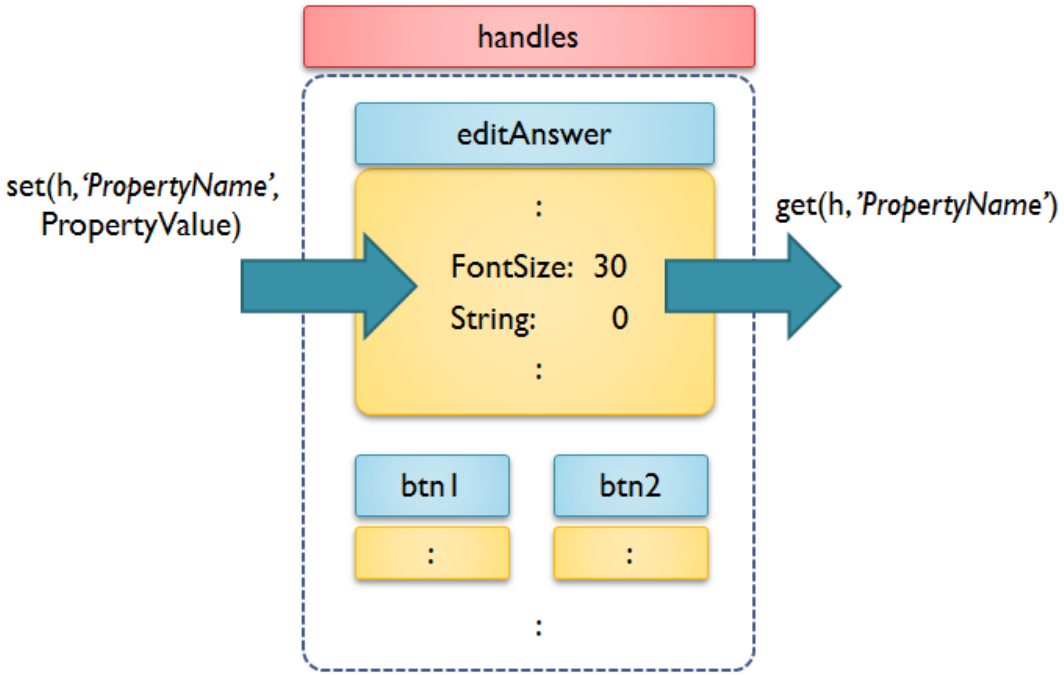


Create GUI controls

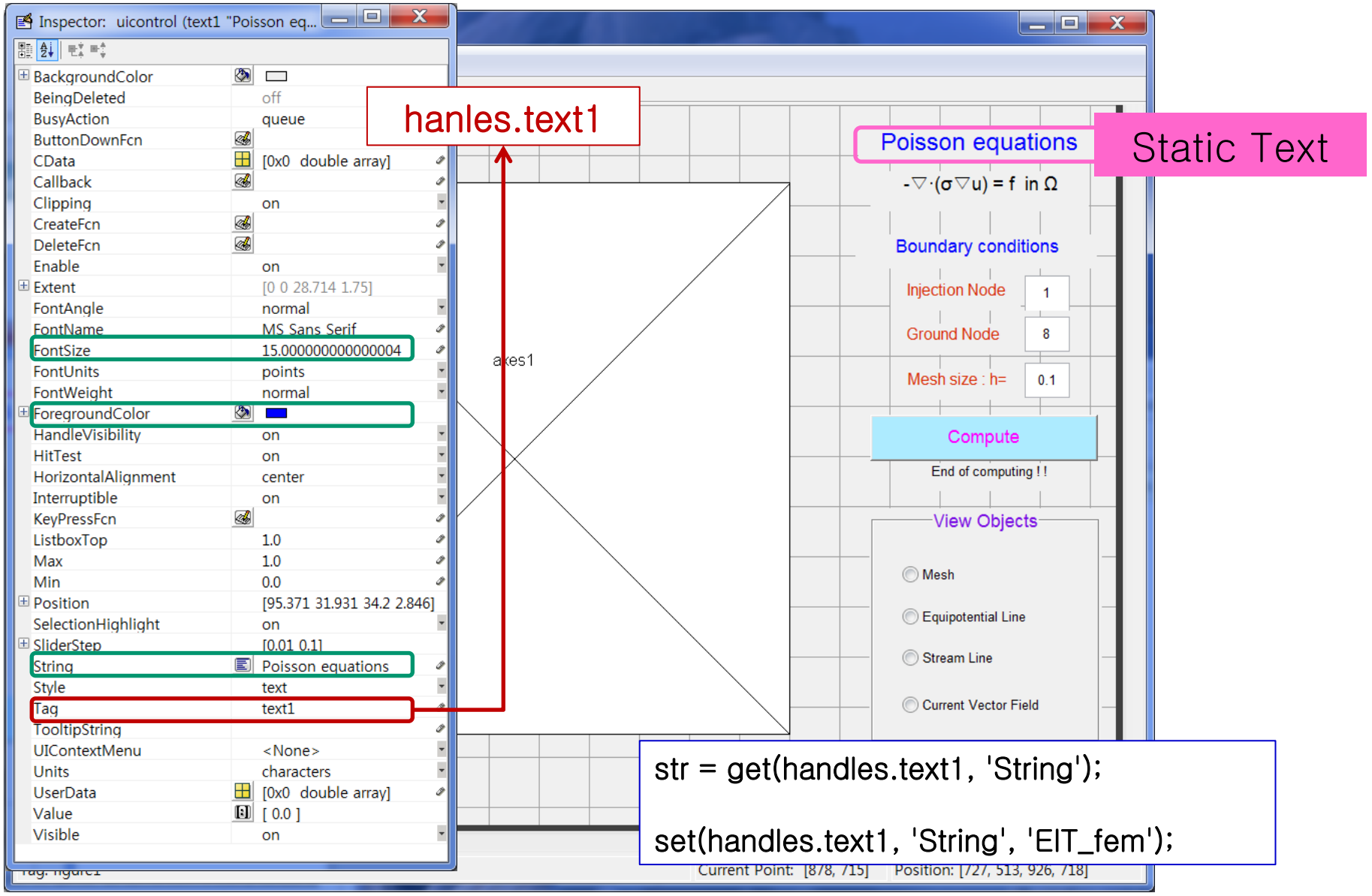


Access to properties of handles

- get(handle, 'PropertyName');
  - ✓ str = get(handles.edit1, 'String');
  - ✓ str_val = str2double(get(handles.edit1, 'String'));
- set(handle, 'PropertyName', 'PropertyValue');
  - ✓ set(handles.edit1, 'String', '1');

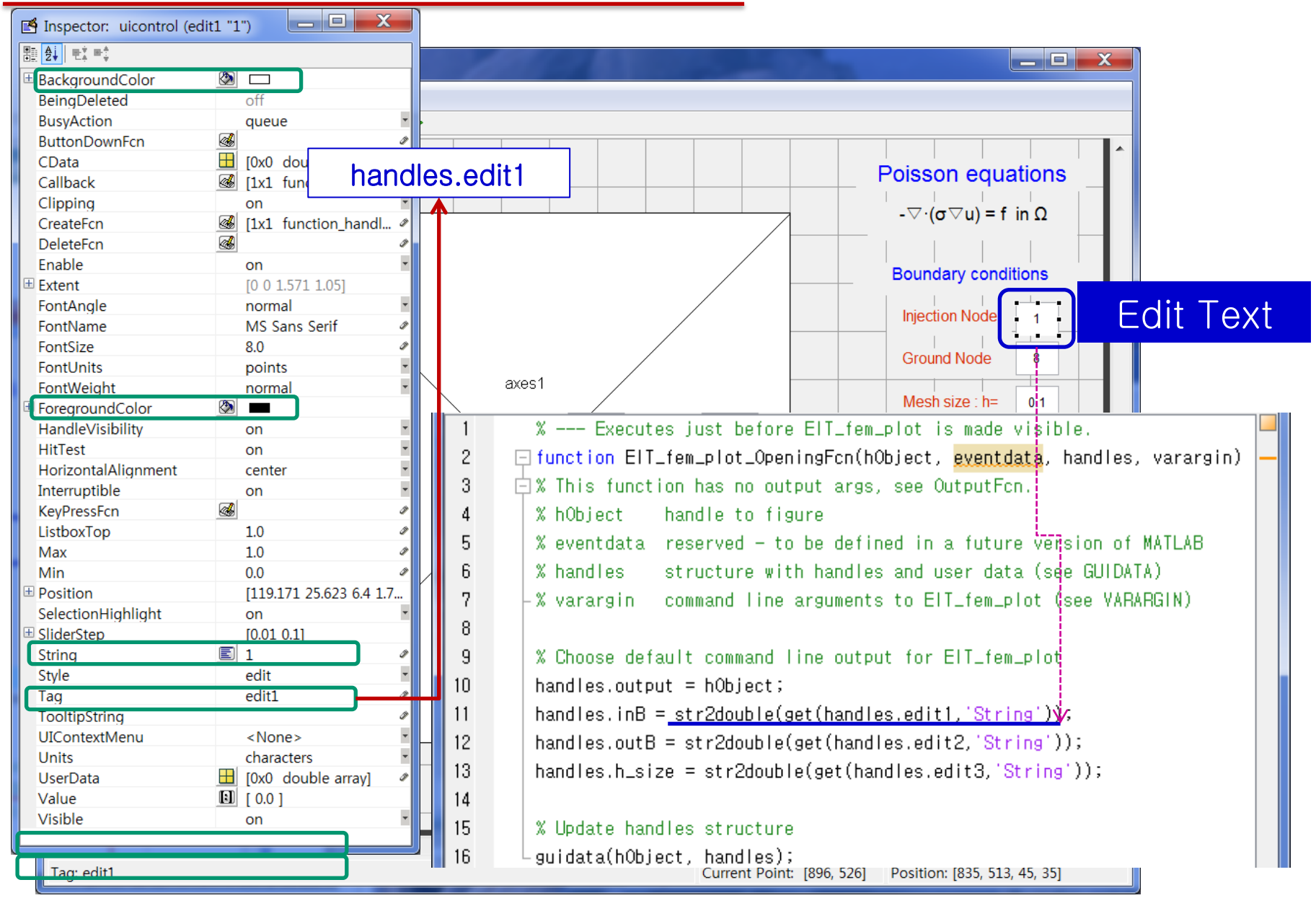


Static text



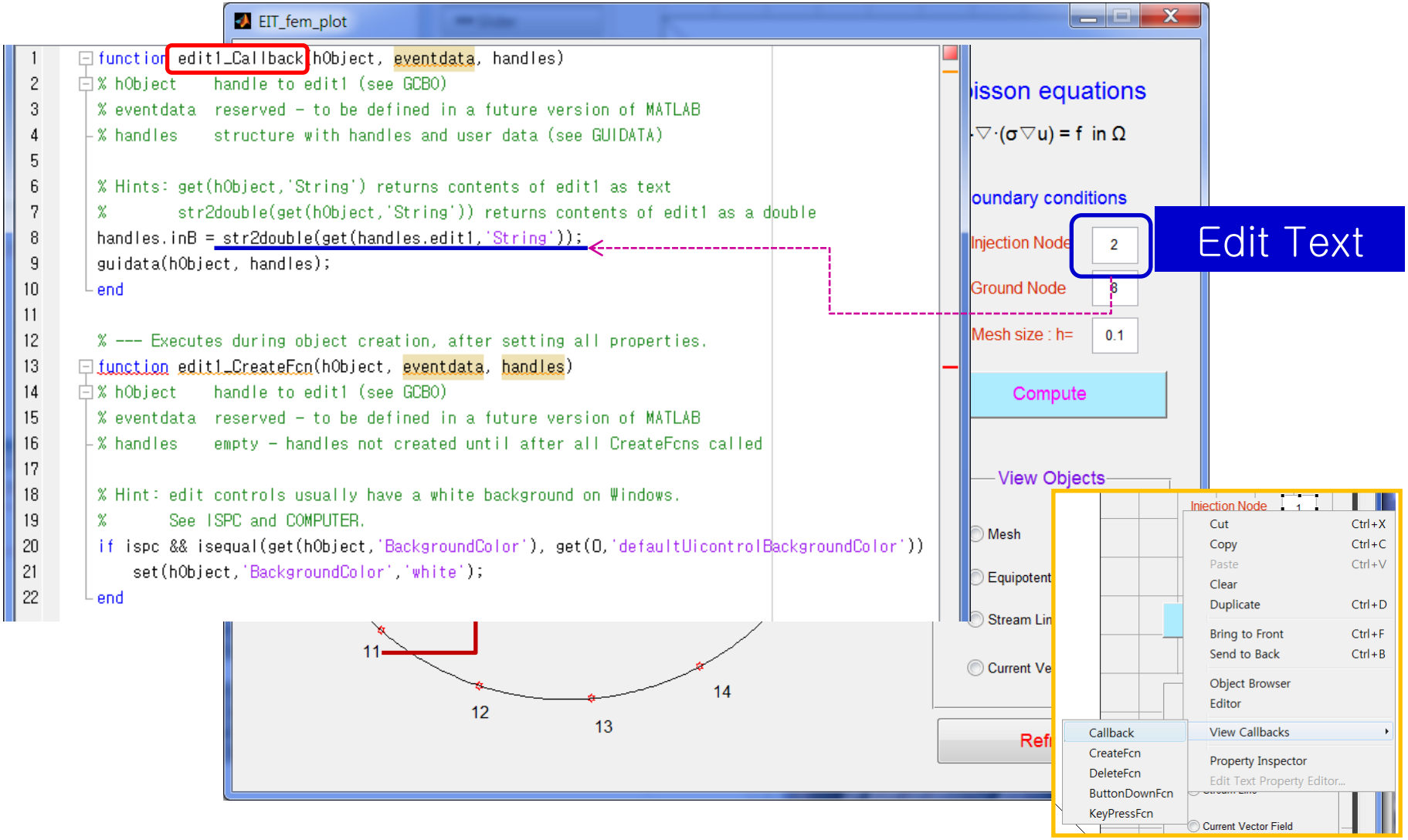

```
str = get(handles.text1, 'String');

set(handles.text1, 'String', 'EIT_fem');
```

Edit text : initialization

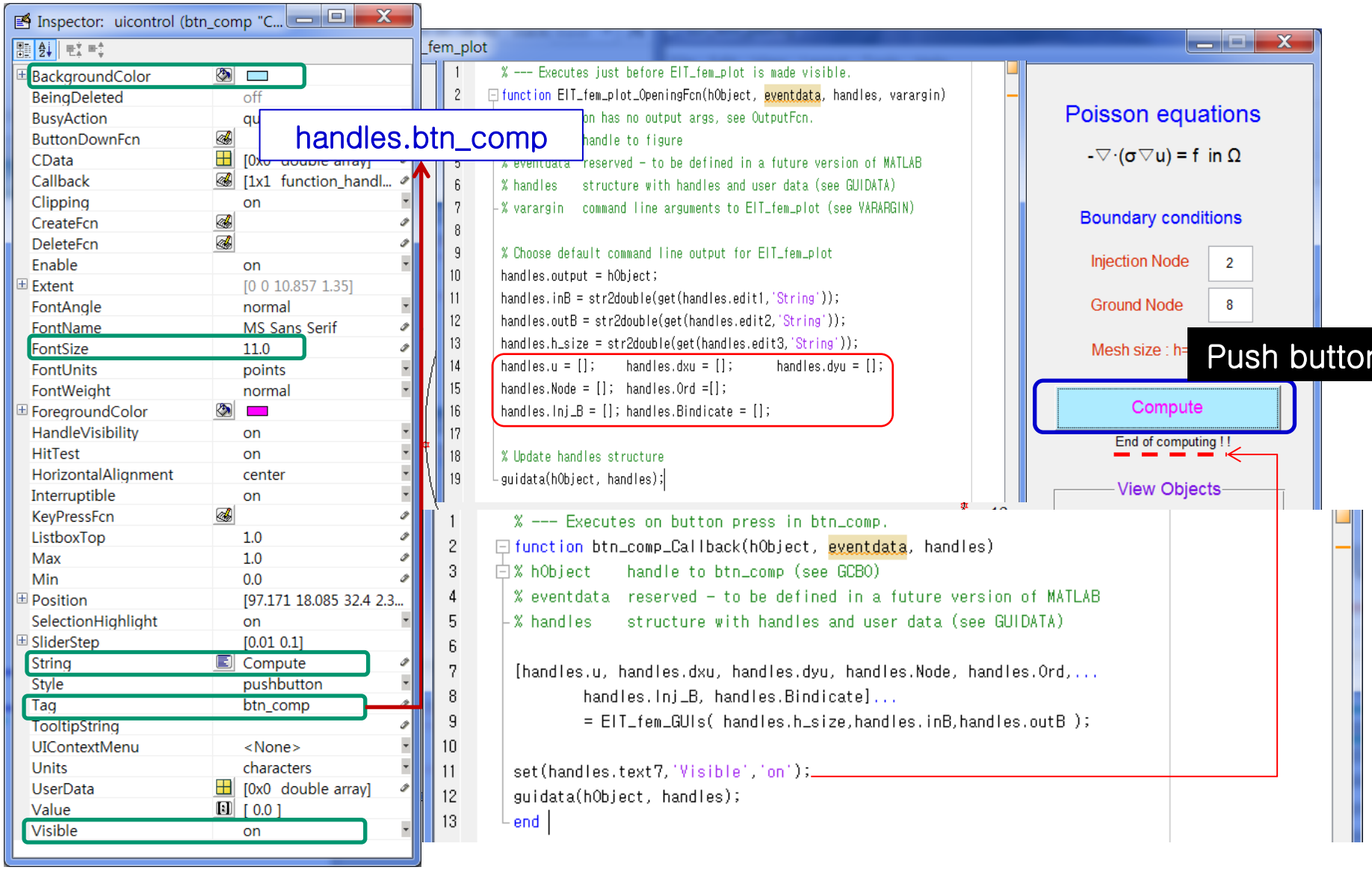


Edit text : update value

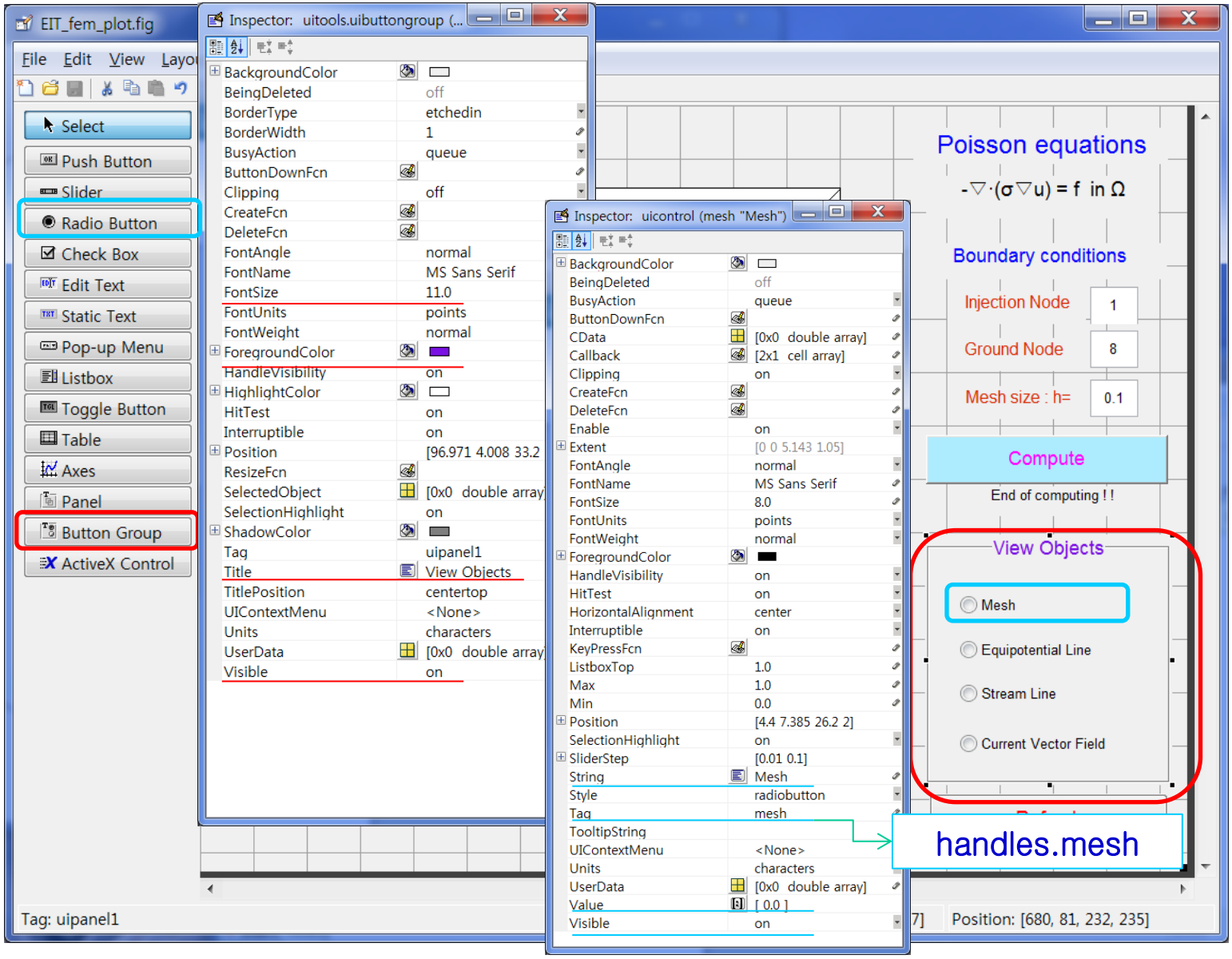
handles.edit1



Push button


Inspector: uicontrol (btn_comp "C...
BackgroundColor
BeingDeleted off
BusyAction
ButtonDownFcn
CData
Callback [1x1 function_handl...
Clipping on
CreateFcn
DeleteFcn
Enable on
Extent [0 0 10.857 1.35]
FontAngle normal
FontName MS Sans Serif
FontSize 11.0
FontUnits points
FontWeight normal
ForegroundColor
HandleVisibility on
HitTest on
HorizontalAlignment center
Interruptible on
KeyPressFcn
ListboxTop 1.0
Max 1.0
Min 0.0
Position [97.171 18.085 32.4 2.3...
SelectionHighlight on
SliderStep [0.01 0.1]
String Compute
Style pushbutton
Tag btn_comp
TooltipString
UIContextMenu <None>
Units characters
UserData [0x0 double array]
Value [0.0]
Visible on
handles.btn_comp
_fem_plot
% --- Executes just before EIT_fem_plot is made visible.
function EIT_fem_plot_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 EIT_fem_plot (see VARARGIN)
% Choose default command line output for EIT_fem_plot
handles.output = hObject;
handles.inB = str2double(get(handles.edit1,'String'));
handles.outB = str2double(get(handles.edit2,'String'));
handles.h_size = str2double(get(handles.edit3,'String'));
handles.u = []; handles.dxu = []; handles.dyu = [];
handles.Node = []; handles.Ord =[];
handles.Inj_B = []; handles.Bindicate = [];
% Update handles structure
guidata(hObject, handles);
Poisson equations
-▽·(σ▽u) = f in Ω
Boundary conditions
Injection Node 2
Ground Node 8
Mesh size : h=
Push button
Compute
End of computing ! !
View Objects
% --- Executes on button press in btn_comp.
function btn_comp_Callback(hObject, eventdata, handles)
% hObject handle to btn_comp (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)
[handles.u, handles.dxu, handles.dyu, handles.Node, handles.Ord,...
handles.Inj_B, handles.Bindicate]...
= EIT_fem_GUIs(handles.h_size,handles.inB,handles.outB);
set(handles.text7,'Visible','on');
guidata(hObject, handles);
end

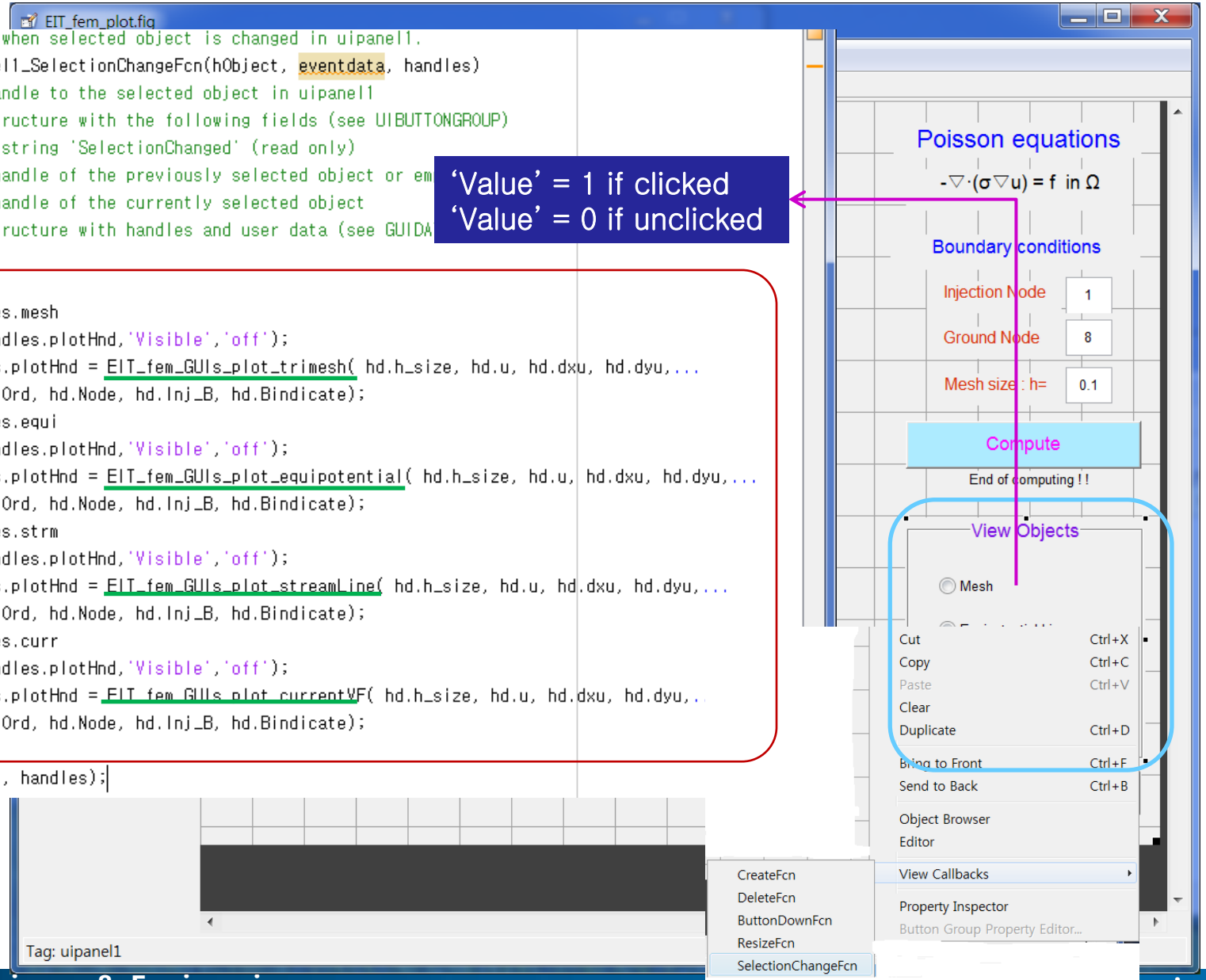
Button Group



Button Group & Radio Button

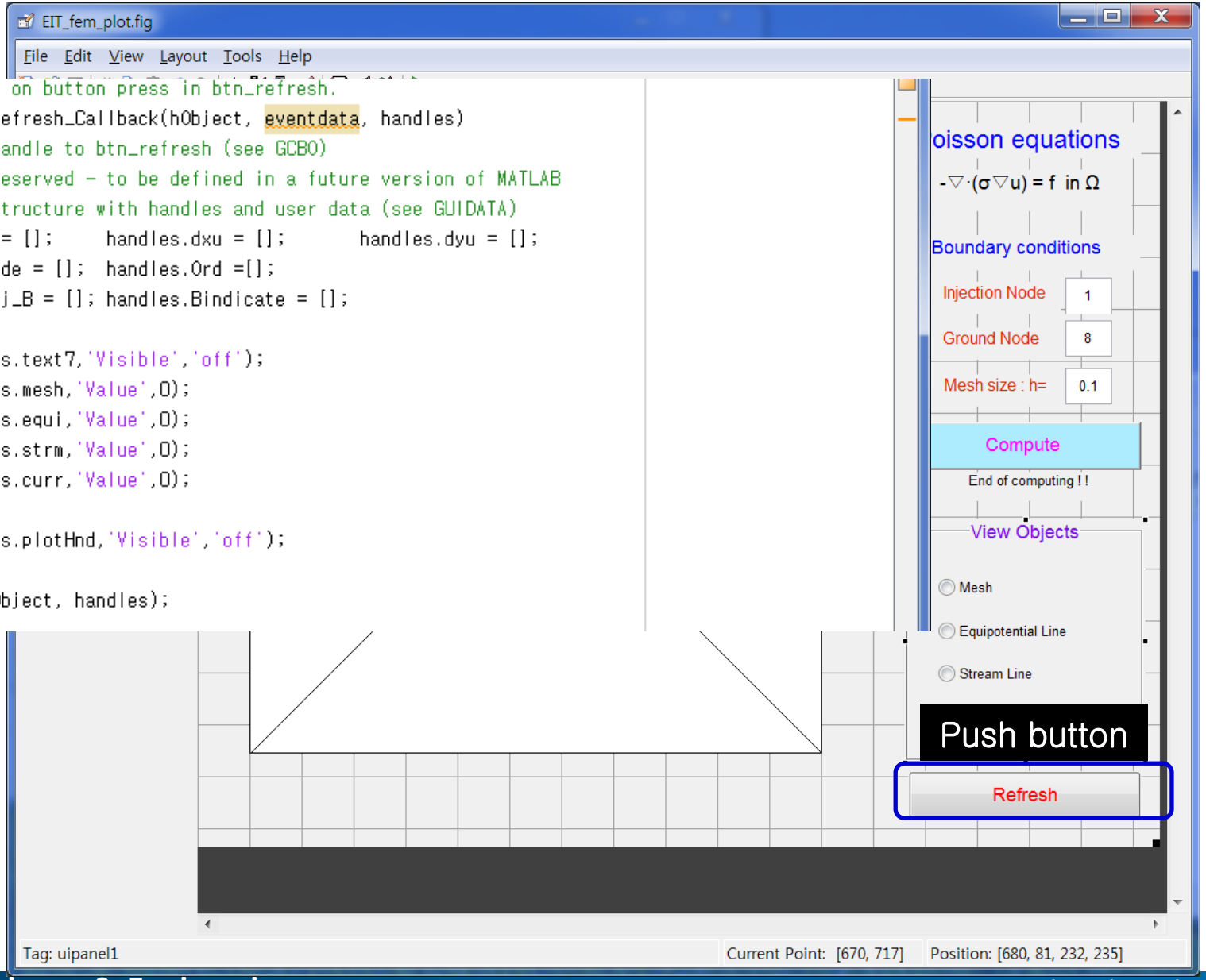
```
% --- Executes when selected object is changed in uipanel1.
function uipanel1_SelectionChangeFcn(hObject, eventdata, handles)
% hObject    handle to the selected object in uipanel1
% eventdata  structure with the following fields (see UIBUTTONGROUP)
%   EventName: string 'SelectionChanged' (read only)
%   OldValue: handle of the previously selected object or em
%   NewValue: handle of the currently selected object
% handles    structure with handles and user data (see GUIDA
hd = handles;
switch hObject
    case handles.mesh
        set(handles.plotHnd,'Visible','off');
        handles.plotHnd = EIT_fem_GUIs_plot_trimesh( hd.h_size, hd.u, hd.dxu, hd.dyu,...
            hd.Ord, hd.Node, hd.Inj_B, hd.Bindicate);
    case handles.equi
        set(handles.plotHnd,'Visible','off');
        handles.plotHnd = EIT_fem_GUIs_plot_equipotential( hd.h_size, hd.u, hd.dxu, hd.dyu,...
            hd.Ord, hd.Node, hd.Inj_B, hd.Bindicate);
    case handles.strm
        set(handles.plotHnd,'Visible','off');
        handles.plotHnd = EIT_fem_GUIs_plot_streamLine( hd.h_size, hd.u, hd.dxu, hd.dyu,...
            hd.Ord, hd.Node, hd.Inj_B, hd.Bindicate);
    case handles.curr
        set(handles.plotHnd,'Visible','off');
        handles.plotHnd = EIT_fem_GUIs_plot_currentVF( hd.h_size, hd.u, hd.dxu, hd.dyu,.
            hd.Ord, hd.Node, hd.Inj_B, hd.Bindicate);
end
guidata(hObject, handles);
```

‘Value’ = 1 if clicked
‘Value’ = 0 if unclicked



Push button

```
% --- Executes on button press in btn_refresh.
function btn_refresh_Callback(hObject, eventdata, handles)
% hObject    handle to btn_refresh (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
    handles.u = [];     handles.dxu = [];       handles.dyu = [];
    handles.Node = [];  handles.Ord =[];
    handles.Inj_B = []; handles.Bindicate = [];

    set(handles.text7,'Visible','off');
    set(handles.mesh,'Value',0);
    set(handles.equi,'Value',0);
    set(handles.strm,'Value',0);
    set(handles.curr,'Value',0);

    set(handles.plotHnd,'Visible','off');

    guidata(hObject, handles);
```



Summaries

- GUIs -- Functions
  - ✓ Components(controls) -- callback function
- Data access
  - ✓ get(…), set(…)
  - ✓ Handles properties
- Planning of working mechanism
  - ✓ Plan flow-chart
  - ✓ Design GUI controls – push button, check box, edit text, etc
- Build the GUIs
  - ✓ Matching the controls with functions and handle variables