

COMS W3101-2

Programming Languages: MATLAB



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http://www1.cs.columbia.edu/~mmerler/comsw3101-2.html

Graphical User Interface (GUI)

- Basic GUI: a menu
- > menu()
 - If graphics are enabled, displays a menu with options
 - k = menu('Choose a Color',...
 'Red', 'Green', ...
 'Blue', 'Cyan');

	×
Choose a color	
Red	
Green	
Blue	
Cyan	

Graphical User Interface (GUI)

- Basic GUI: a menu
- menu()
 - o colors = { 'Red', 'Green', 'Blue', 'Cyan' };
 - k = menu('Choose a color', colors);
 - o fprintf('you picked %s\n',colors{k});



GUI

- There are 4 steps in creating a GUI:
- 1. Designing the GUI
- 2. Laying out the GUI (with the layout editor)
- 3. Programming the GUI (write the callbacks in the .m file)
- 4. Saving and Running the GUI



GUI - Laying out the GUI

To start the MATLAB GUI Layout Editor creation environment, type 'guide' in the command window

GUIDE Quick Start	
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Blank GUI, we can add anything we want

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GUI with Ulcontrols

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GUI with Axes and Menu

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Modal Question Dialog	
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Modal Question Dialog

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Create a GUI where the user can insert 2 numbers and we compute their sum

Input1 + Input2 = Result



- 3 Static Texts
- 2 Edit Texts
- I Push Button

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 Properties Inspector can be opened by double clicking on item or using the menu bar

button



Set the text 'String' and 'FontSize' properties in the Static Text items



Set the text 'String' and 'FontSize' properties in the Static Text items

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Tagging Elements

- It is very important to assign a unique name to each element, so that we can refer to it in the programming stage
- We can do it by using the 'tag' property in the property inspector

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Set the 'Tag,' 'String' and 'FontSize' properties in the Edit Text items



Set the 'Tag,' 'String' and 'FontSize' properties in the Edit Text items

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Set the 'Tag,' 'String' and 'FontSize' properties in the PushButton item

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Saving the GUI

- MATLAB saves the GUI in 2 files:
- .fig file, containing a complete description of the GUI figure, layout and the components of the GUI
 - Changes to this file are made in the Layout Editor
- In file containing the code that controls the GUI
 - You can program the callbacks in this file using the Mfile Editor



- Handle Graphics refers to the system of graphics objects that MATLAB uses to implement graphing and visualization functions.
- Each graphics objects is defined by:
 - A unique identifier, called handle
 - A set of properties, defining its appearance



 Handle Graphics objects are organized in a hierarchy



- > There are 2 ways to obtain an object's handle:
 - Upon creation:
 - h = plot(x, y);
 - Using dedicated functions:
 - 0 root object handle (the screen)
 - gcf returns the handle for current figure
 - gca returns the handle for current axes
 - gco returns the handle for current object
 - gcbf returns the handle for callback figure
 - gcbo returns the handle for callback object



- Modifying Properties
 - Return a list of all object properties and their current values:
 - get(handle)
 - Return current value of an object property:
 - get(handle, 'PropertyName')
 - Return a list of all user-settable object properties and their current values:
 - set(handle)
 - set(handle, 'PropertyName', 'NewValue')

• Example

- x = [-pi:0.01:pi];
- plot(x,sin(x));
- set(gca, 'XDir', 'Reverse');
- All the above can also be modified using the Property Editor

- A callback is a sequence of commands that are executed when a graphics object is activated
- Stored in the GUI's M-file
- Is a property of a graphics object (e.g. CreateFnc, ButtonDwnFnc, Callback, DeleteFnc)
- A callback is usually made of the following stages:
 - 1. Getting the handle of the object initiating the action (the object provides event / information / values)
 - 2. Getting the handles of the objects being affected (the object whose properties are to be changed)
 - 3. Getting necessary information / values
 - 4. Doing some calculations and processing
 - 5. Setting relevant object properties to effect action

Edit the callbacks for the Edit Text boxes



With the **f** menu we can jump to any function in the .m file

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```
function Input1 Callback(hObject, eventdata, handles)
% hObject handle to Input1 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)
% Hints: get(hObject,'String') returns contents of Input1 as text
in1 = str2double(get(hObject,'String')); % returns contents of Input1 as a double
if (isempty(in1))
     set(hObject,'String','0')
end
guidata(hObject, handles);
function Input2 Callback(hObject, eventdata, handles)
% hObject handle to Input2 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)
% Hints: get(hObject,'String') returns contents of Input2 as text
in2 = str2double(get(hObject, 'String')); % returns contents of Input2 as a double
if (isempty(in2))
    set(hObject,'String','0')
end
guidata(hObject, handles);
```

```
function Input1 Callback(hObject, eventdata, handles)
% hObject handle to Input1 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)
% Hints: get(hObject,'String') returns contents of Input1 as text
in1 = str2double(get(hObject,'String')); % returns contents of Input1 as a double
if (isempty(in1))
    set(hObject,'String','0')
                                         handles is a struct containing all the
guidata(hObject, handles);
```

graphics objects in the GUI

function Input2 Callback(hObject, eventdata, handles) % hObject handle to Input2 (see GCBO) % eventdata reserved - to be defined in a future version of MATLAB % handles structure with handles and user data (see GUIDATA) % Hints: get(hObject,'String') returns contents of Input2 as text

```
in2 = str2double(get(hObject, 'String')); % returns contents of Input2 as a double
if (isempty(in2))
```

```
set(hObject,'String','0')
```

end

guidata(hObject, handles);



Edit the callback for the Push Button

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% --- Executes on button press in Execute. function Execute_Callback(hObject, eventdata, handles) % hObject handle to Execute (see GCBO) % eventdata reserved - to be defined in a future version of MATLAB % handles structure with handles and user data (see GUIDATA) in1 = get(handles.Input1,'String'); in2 = get(handles.Input2,'String'); % a and b are variables of Strings type, and need to be converted % to variables of Number type before they can be added together

```
sum12 = str2num(in1) + str2num(in2);
sum12str = num2str(sum12);
% need to convert the answer back into String type to display it
set(handles.ResultText,'String',sum12str);
guidata(hObject, handles);
```







```
% --- 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)
xLow = str2num(get(handles.edit1,'String'));
xHigh = str2num(get(handles.edit2,'String'));
x = [xLow : 0.01 : xHigh];
```

```
axes(handles.axes1); % select the axes where to draw
plot(x,sin(x));
set(handles.axes1,'LineWidth',4);
guidata(hObject,handles);
```





im = imread('img.jpg');

image(im, 'parent', handles.axes1);



