

LAB 7: Forecast Surface Low Pressure

- تنفيذ البرنامج الرئيسي لبرنامج التنبؤ بمركز المنخفض الجوي في برنامج ماتلاب (empirical33.m)
- استدعاء الدالة (emperical11.m) (البرنامج الفرعي)
- المعادلات المستخدمة في برنامج التنبؤ Forecast Surface Low Pressure
- المصادر Reference

Mohsin H. Dawood (2019) *Mustansiriyah University, College of Science, Department of Atmospheric Sciences, Effect of Polar Jet Stream on Extreme Surface Weather conditions*, PhD. thesis.

المناقشة والاجابة على بعض الاسئلة

- 1- هل يمكن تطوير البرنامج ؟
- 2- هل يمكن التعديل على البرنامج ؟
- 3- هل يمكن انشاء نموذج تنبؤي اخر ؟
- 4- هل يمكن زيادة فترة التنبؤ ؟

LAB7 : Forecast Surface Low Pressure

برنامج التنبؤ بالمنخفض الجوي

LAB 7 :- Forecast the surface low pressure center value and position from the polar jet core speed value and position.

Polar Jet Core Simple program

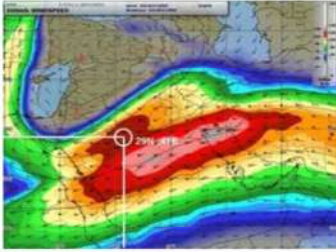
In this chapter is used the empirical technique has been used to suggest a simple program to forecast the surface low pressure center value and position from the polar jet core speed value and position. The empirical technique depended on the analysis two sets charts upper wind speed charts at 300 hPa level and surface charts during period (2014-2016). The program core engine based on two operations the first one calculates the surface low pressure center in (hPa) from the jet core speed in (knot) while the second one found the position of surface low pressure center from the position of jet core speed.

LAB7 : Forecast Surface Low Pressure

برنامج التنبؤ بالمنخفض الجوي

هو برنامج بسيط يستخدم التقنية التجريبية لعمل تنبؤ بقيمة مركز المنخفض الجوي السطحي وموقعه بالاعتماد على قيمة سرعة التيار النفث القطبي وموقعه. اعتمدت التقنية التجريبية على تحليل مجموعتين من الرسوم البيانية لمخططات سرعة الرياح العليا عند مستوى 300 hPa والمخططات السطحية خلال الفترة (2014-2016). يعتمد المحرك الأساسي للبرنامج على عمليتين ، الأولى تحسب مركز المنخفض الجوي للسطح بوحدة (hPa) من خلال سرعة التيار النفث (بالعقدة) وثانيا لتحديد موقع مركز المنخفض الجوي السطحي من موقع سرعة التيار النفث.

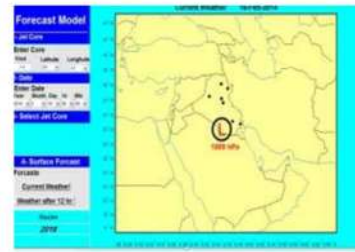
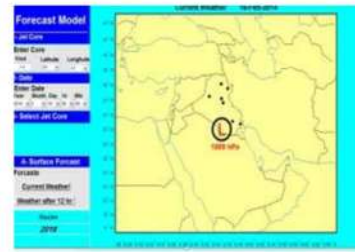
LAB7:MATLAB GUI Programming



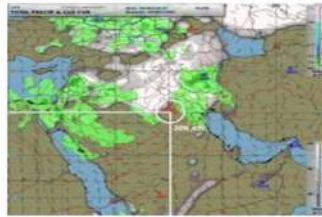
(a) Core speed time, value and position (00 UTC, 110 kt, 29N,41E)



(b) Actual surface low pressure position (00 UTC, 1009 hPa, 31N,42E)



(d) Actual surface low pressure position 12 UTC, 1006 hPa, 30N,45E



(e) forecasted surface low pressure position 12 UTC, 1009 hPa, 31N,48E



LAB7:MATLAB GUI Programming

Forecast Model

1- Jet Core

Enter Core
Knot Latitude Longitude
60 33 39

2- Date

Enter Date
Year Month Day hr Min
2020 5 31 00 00

3- Select Jet Core

Jet Type
 Continues
 Discontinues

4- Surface Forcast

Forcaste

*Iraqi Air Force
Hazim & Firas
2018*

Current Weather 31-May-2020

The map displays a low pressure system (L) centered over the Middle East region, with a pressure value of 1018 hPa. The map covers a latitude range from 15° N to 45° N and a longitude range from 15° E to 65° E. The background is yellow, and the map shows the outlines of the Middle East and surrounding regions.

LAB7:MATLAB GUI Programming

Forecast Model

1- Jet Core

Enter Core

Knot Latitude Longitude
60 33 39

2- Date

Enter Date

Year Month Day hr Min
2020 5 31 00 00

3- Select Jet Core

Jet Type

- Continues
- Discontinues

4- Surface Forecast

Forcaste

Current Weather

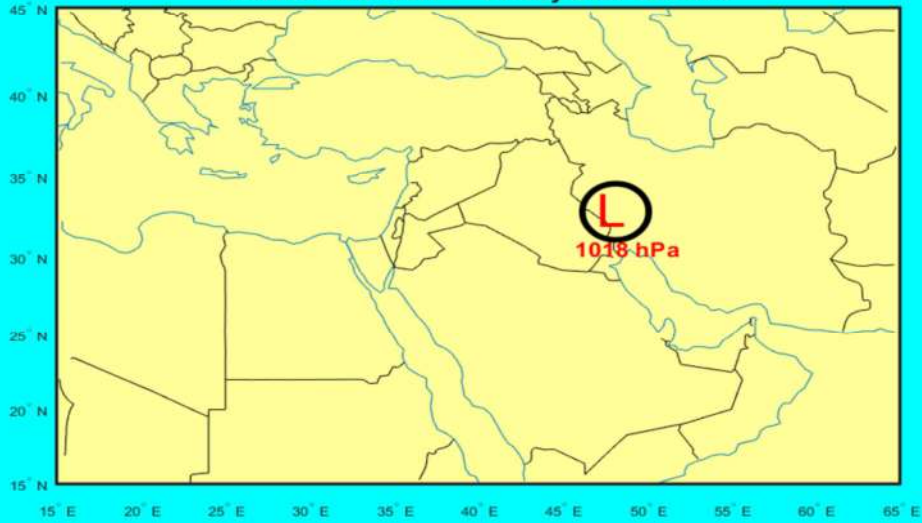
Weather after 12 hr

Iraqi Air Force

Hazim & Firas

2018

Weather After 12hr 31-May-2020 12:00:00



LAB7:MATLAB GUI Programming

The image shows a MATLAB GUI titled "Forecast Model" with a light blue background. The interface is divided into several sections on the left and a map on the right. The left sections are:

- 1- Jet Core**: "Enter Core" with input fields for "Knot", "Latitude" (containing "lat1"), and "Longitude" (containing "long1").
- 2- Date**: "Enter Date" with dropdown menus for "Year", "Month", "Day", "hr", and "Min".
- 3- Select Jet Core**: "Jet Type" with radio buttons for "Continues" and "Discontinues".
- 4- Surface Forecast**: "Forcaste" with buttons for "Current Weather" and "Weather after 12 hr".

At the bottom left, the text "Iraqi Air Force", "Hazim & Firas", and "2018" is displayed. The right side features a map of the Middle East region with latitude (16°N to 44°N) and longitude (26°E to 64°E) markers. A red line with black dots represents a jet core path. Four red callout boxes with arrows point to specific GUI elements:

- 1- Enter core speed & location**: Points to the "Knot" input field.
- 2- Enter Date**: Points to the "Year" dropdown menu.
- Select polar jet - type continuous or discontinuous**: Points to the "Continues" radio button.
- 4- Run : press Current Weather & Weather after 12 hr**: Points to the "Current Weather" button.

LAB7:MATLAB GUI Programming

```
clc,clear all
format longE
load COMPONENT_12 longg latt
U_300=input('core value=');
lat1=input('enter latitude for core=');
long1=input('enter longitude for core=');
yy=input('enter year=');
mm=input('enter month=');
dd=input('enter day=');
hh=input('enter hour=');
Min=input('enter minute=');
[LONG_min,LAT_min,long_300_12,lat_300_12,long_low_00,lat_low_00,long_low_12...
 ,lat_low_12,CORE_300_long_1200,CORE_300_lat,CORE_MSL_long,CORE_MSL_lat,...
CORE_MSL_long_1200,CORE_MSL_lat_1200,LOW_P_00,LOW_P_1200]=emperical11(longg,latt,...
 long1,lat1,U_300,yy,mm,dd,hh);
figure1=3;
time_12= datenum(0,0,0,12,0,0);
A= datenum(yy,mm,dd,hh,Min,0);
```

LAB7:MATLAB GUI Programming

```
Z=[];
%Z=Z*0+850;
Z=LOW_P_00;
new21(Z,A,CORE_MSL_long,CORE_MSL_lat,figure1);
figure1=4;
A=A+time_12;
%Z=rand(g,1)+750;
Z=LOW_P_1200;
new21(Z,A,CORE_MSL_long_1200,CORE_MSL_lat_1200,figure1);
function new21(Z,A,long1,lat1,figure1)
figure(figure1)
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
axesm('miller','maplatlim',[15 45],'maplonlim',[25 65])
framem;
gridm;
mlabel;
plabel
load coastlines
plotm(coastlat,coastlon)
tightmap
```


LAB7:MATLAB GUI Programming

```
load worldlo.mat;
%gridm minor
geoshow('worldrivers.shp', 'Color', 'b')%rever blue
land=shaperead('landareas','UseGeoCoords',false); %show land
setm(gca,'ffacecolor','none') %using this line the seas are colored in blue
geoshow('landareas.shp')
NameArray = {'LineStyle'};
ValueArray = {'-'}';
colormap('white')
land = shaperead('landareas.shp', 'UseGeoCoords', true);
geoshow(land, 'FaceColor',[1 1 0.6]);% COLOR CREAM
lakes = shaperead('worldlakes', 'UseGeoCoords', true);
geoshow(lakes, 'FaceColor', [.5 .7 .9])
rivers = shaperead('worldrivers', 'UseGeoCoords', true);
geoshow(rivers, 'Color', 'blue')
cities = shaperead('worldcities', 'UseGeoCoords', true);
geoshow(cities, 'Marker', '.', 'Color', 'red')
oceanColor = [.5 .7 .9];
setm(gca, 'FFaceColor', oceanColor)
setm(gca, 'MLineLocation',2,'PLineLocation',2)
```

LAB7:MATLAB GUI Programming

```
setm(gca, 'MLabelLocation', 2, 'PLabelLocation', 2, 'MLabelParallel', 'south')
%draw political boundary
a=Poline(1);
latg=a.lat;
longg=a.long;
h=plotm(latg, longg, 'k-');
lat1=double(lat1);
long1=double(long1);
textm(lat1, long1, 'L', 'FontSize', 35, 'color', 'r')
hold on
textm(lat1+1.3, long1-1.7, 'o', 'FontName', 'FixedWidth', 'FontSize', 105, 'color', 'k')
textm(lat1-2.5, long1-1.3, [num2str(Z) '
title(num2str(datestr(A)), 'color', 'k', 'fontweight', 'bold', 'fontsize', 14, 'fontname', 'arial')
% syms Haditha Nasiriyah Basra Baghdad Balad sulaymaniyah Erbil
h1 = plot(-0.0526, 0.6232, 'o', 0.0208, 0.5582, 'o', 0.045, 0.551, 'o', -1, 0.5, 'o'...
, -0.009767, 0.6066, 'o', -0.01477, 0.6181, 'o', 0.0055, 0.6449, 'o', -0.0154, 0.6559, 'o');
set(h1, 'MarkerEdgeColor', 'k', 'MarkerFaceColor', 'k')
end
```

Forecast Model

1-Jet core

value		knot
position	latitude	longitude

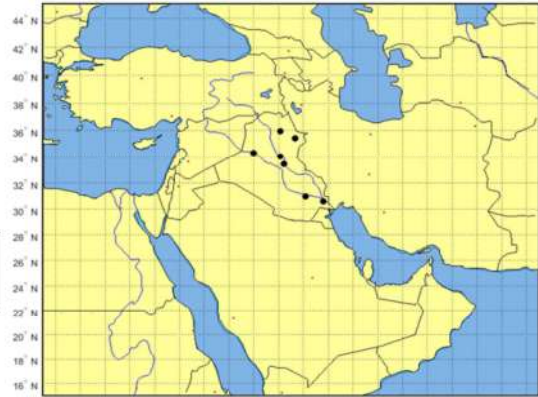
2-Date

year	
month	
day	
hour	

Jet type

- Continues
- Discontinuous

RUN



MATLAB GUI Programming

Graphical User Interface
Widgets and Callbacks
GUIDE, FIG-Files and M-Files

MATLAB GUI Programming

Graphical User Interface -

Widgets and Callbacks -

GUIDE , FIG-Files and M-Files -

يتضمن برنامج الواجهة الرسومية في برنامج ماتلاب :-

واجهة المستخدم الرسومية

استخدام الادوات وعملها

استخدام الامر GUIDE و تصميم الشكل و كتابة البرنامج

What Is GUIDE?

GUIDE, the MATLAB® **G**raphical **U**ser **I**nterface **d**evelopment **e**nvironment, provides a set of tools for creating graphical user interfaces (GUIs). These tools greatly simplify the process of designing and building GUIs.

What Is GUIDE?

GUIDE, the MATLAB® Graphical User Interface development environment,

provides a set of tools for creating graphical user interfaces (GUIs).

These tools greatly simplify the process of designing and building GUIs.

ما هو GUIDE ؟

مصطلح guide هو بيئة تطوير واجهة رسومية للمستخدم في برنامج ماتلاب .
ويوفر مجموعة من الادوات لانشاء واجهات رسومية للمستخدم (GUIs) . وهذه الأدوات
سهلة الاستخدام بشكل يجعل عملية تصميم وبناء الواجهات الرسومية .

Starting GUIDE

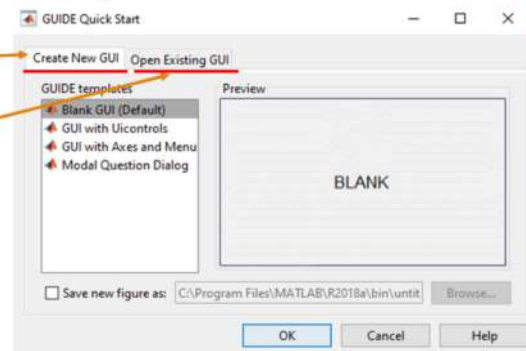
To start GUIDE, enter **guide** at the MATLAB prompt. This displays the GUIDE Quick Start dialog, as shown in the following figure.

From the Quick Start dialog, you can

- **Create a new GUI** from one of the GUIDE templates — prebuilt GUIs that you can modify for your own purposes.

- **Open an existing GUI.**

Once you have selected one of these options, clicking OK opens the GUI in the Layout Editor.



استخدام الامر GUIDE

لفتح واجهة رسومية ابدا بكتابة الامر **guide** في نافذة الاوامر

هناك خيارين لبدء العمل مع الواجهة الرسومية لبرنامج ماتلاب

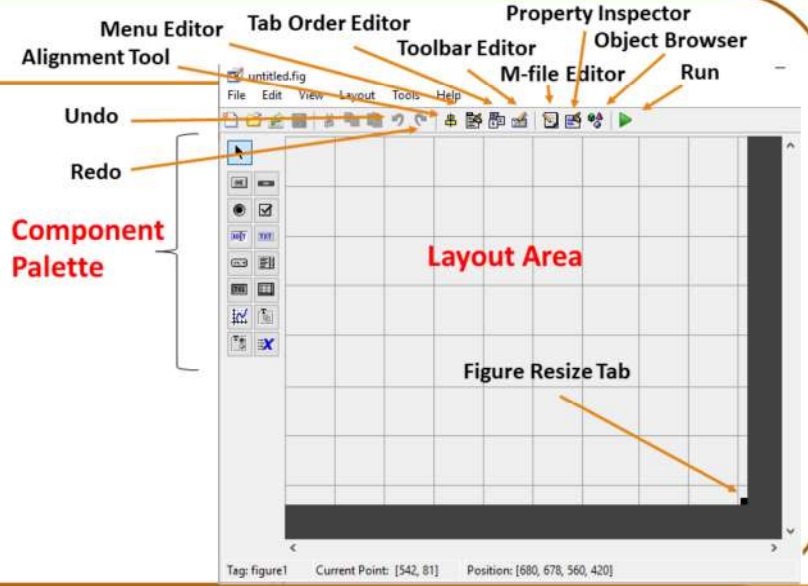
- **Greate a new GUI** انشاء واجهة رسومية جديدة فارغة

- **Open an existing GUI** فتح واجهة رسومية محفوظة سابقا لتنفيذها او التعديل

عليها

The Layout Editor

When you open a GUI in GUIDE, it is displayed in the **Layout Editor**, which is the **control panel for all of the GUIDE tools**. The following figure shows the Layout Editor with a blank GUI template.



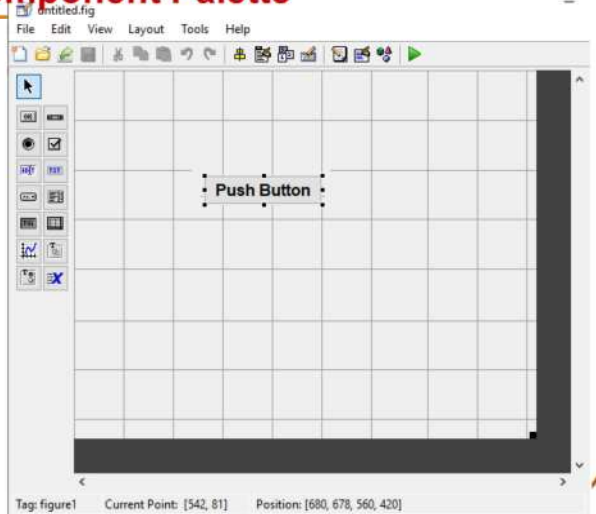
The Layout Editor منقح التصميم (المخطط)

وهو الواجهة التي تظهر عند البدء بتشغيل الواجهة الرسومية الجديدة او الحالية المحفوظة للتعامل مع الادوات بالاضافة او التعديل على مخطط التصميم .

- وتحتوي واجهة التصميم على التالي :-
- مساحة المخطط **Layout Area** : وهي مساحة العرض او الشاشة التفاعلية باضافة وعرض المكونات من لوحة المكونات وهذه الشاشة هي التي يتم تصميم الواجهة عليها واظهارها بالشكل النهائي للبرنامج.
- ومجموعة من الادوات المستخدمة في التصميم **Component Palette** وهي مركبات التصميم مثل اداة النص لاضافة العنوان وادوات التأثير على النقر داخل البرنامج وادوات تستخدم لادخال البيانات واخراج الاشكال والرسم .. الخ من الادوات التي نختار منها مايلئم التصميم .
- شريط ادوات التشغيل **Toolbar Editor** وهو شريط في اعلى مخطط التصميم يحتوي على ادوات التشغيل وعرض نص البرنامج وادوات النسخ واللصق والادوات المساعدة الاخرى في التصميم .

Selecting Components from the Component Palette

You can lay out your GUI by dragging components, such as **push buttons**, **pop-up menus**, or **axes**, from the **component palette**, at the left side of the Layout Editor, into the **layout area**. For example, if you drag a push button into the layout area, it appears as in the following figure.



16

Selecting Components from the Component Palette

عرض واختيار الادوات من لوحة المكونات **component palette** عملية الاختيار و اظهار اي مركبة من الادوات على يسار واجهة المخطط يكون بالضغط على الاداة واختيار المكان او بالسحب والافلات على مساحة المخطط **Layout Area** كما في الشكل اعلاه عند اختيار اداة ضغط الزر **Push Button** , وهكذا عند اختيار بقية الادوات وادراجها في مساحة التصميم او المخطط **Layout Area** .

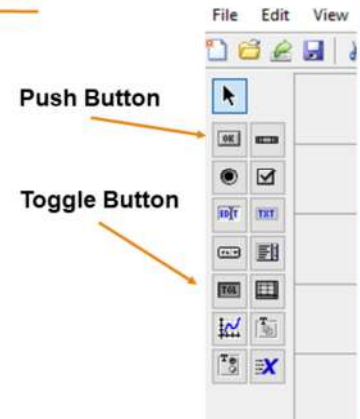
Selecting Components from the Component Palette

1. Push Button

Push buttons generate an action when clicked. For example, an **OK** button might close a dialog box and apply settings. When you click a push button, it appears depressed; when you release the mouse, the button appears raised and its callback executes.

2. Toggle Button

Toggle buttons generate an action and indicate whether they are turned on or off. When you click a toggle button, it appears depressed, showing that it is on. When you release the mouse button, the toggle button's callback executes. However, unlike a push button, the toggle button remains depressed until you click the toggle button a second time. When you do so, the button returns to the raised state, showing that it is off, and again executes its callback.



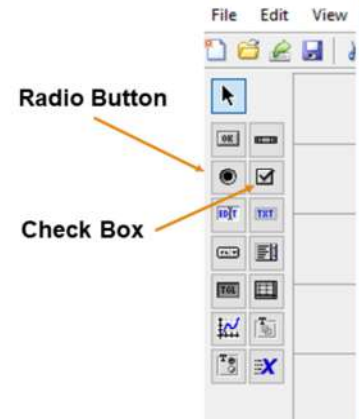
Selecting Components from the Component Palette

3. Radio Button

Radio buttons are similar to check boxes, but are typically mutually exclusive within a group of related radio buttons. That is, you can select only one button at any given time. To activate a radio button, click the mouse button on the object. The display indicates the state of the button.

4. Check Box

Check boxes generate an action when checked and indicate their state as checked or not checked. Check boxes are useful when providing the user with a number of independent choices that set a mode, for example, displaying a toolbar or generating callback function prototypes.



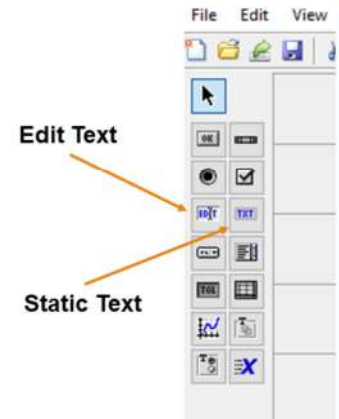
Selecting Components from the Component Palette

5. Edit Text

Edit text controls are fields that enable users to enter or modify text strings. Use edit text when you want text as input. The String property contains the text entered by the user. The callback executes when you press **Enter** for a single-line edit text, **Ctrl+Enter** for a multi-line edit text, or the focus moves away.

6. Static Text

Static text controls display lines of text. Static text is typically used to label other controls, provide directions to the user, or indicate values associated with a slider. Users cannot change static text interactively and there is no way to invoke the callback routine associated with it.



Selecting Components from the Component Palette

7. Slider

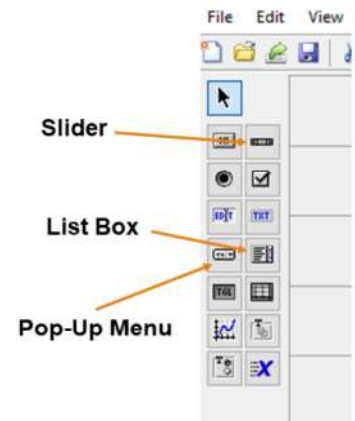
Sliders accept numeric input within a specific range by enabling the user to move a sliding bar, which is called a slider or thumb. Users move the slider by pressing the mouse button and dragging the slider, by clicking in the trough, or by clicking an arrow. The location of the slider indicates a percentage of the specified range.

8. List Box

List boxes display a list of items and enable users to select one or more items.

9. Pop-Up Menu

Pop-up menus open to display a list of choices when users click the arrow.



Selecting Components from the Component Palette

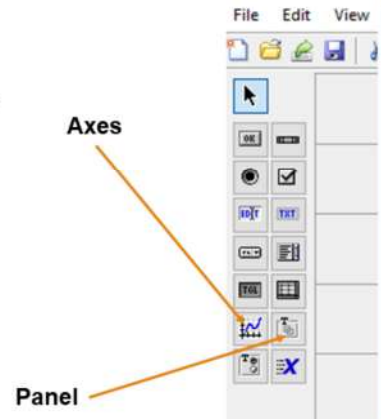
10. Axes

Axes enable your GUI to display graphics (e.g., graphs and images). Like all graphics objects, axes have properties that you can set to control many aspects of its behavior and appearance. See "Axes Properties" in the MATLAB Graphics documentation for more information on axes objects.

11. Panel

Panels group GUI components. Panels can make a user interface easier to understand by visually grouping related controls. A panel can have a title and various borders.

Panel children can be panels and button groups as well as axes and user interface controls. The position of each component within a panel is interpreted relative to the panel. If you move the panel, its children move with it and maintain their positions on the panel.



Selecting Components from the Component Palette

12. Button Group

Button groups are like panels but can be used to manage exclusive selection behavior for radio buttons and toggle buttons.

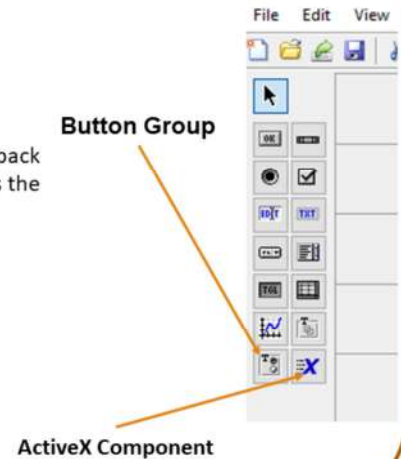
For radio buttons and toggle buttons that are managed by a button group, you must include the code to control them in the button group's SelectionChangeFcn callback function, not in the individual uicontrol Callback functions. A button group overwrites the Callback properties of radio buttons and toggle buttons that it manages.

13. ActiveX Component

ActiveX components enable you to display ActiveX controls in your GUI.

Note Only figures can have child ActiveX components. Panels and button groups cannot.

ActiveX components are available only on the Microsoft Windows platform.



LAB7:MATLAB GUI Programming

```
function varargout = interfacel(varargin)
% INTERFACEL MATLAB code for interfacel.fig
%   INTERFACEL, by itself, creates a new INTERFACEL or raises the existing
%   singleton*.
%
%   H = INTERFACEL returns the handle to a new INTERFACEL or the handle to
%   the existing singleton*.
%
%   INTERFACEL('CALLBACK',hObject,eventData,handles,...) calls the local
%   function named CALLBACK in INTERFACEL.M with the given input arguments.
%
%   INTERFACEL('Property','Value',...) creates a new INTERFACEL or raises the
%   existing singleton*. Starting from the left, property value pairs are
%   applied to the GUI before interfacel_OpeningFcn gets called. An
%   unrecognized property name or invalid value makes property application
%   stop. All inputs are passed to interfacel_OpeningFcn via varargin.
%   *See GUI Options on GUIDE's Tools menu. Choose "GUI allows only one
%   instance to run (singleton)".
% See also: GUIDE, GUIDATA, GUIHANDLES
```

LAB7:MATLAB GUI Programming

How to convert my GUI program to an exe file?

1. Make sure you have MATLAB Compiler and a supported C compiler
2. Run the command `mbuild -setup` to select your C compiler
3. Enter `deploytool` to open the deployment tool window; create a new project at the prompt
4. Under the "build" tab, click the links "add main file" and "add files/directory" and add your MATLAB GUI code files (and data files, if necessary)
5. Click the "build" button.