



Engineering Solutions using MATLAB

Graphical User Interfaces (GUI)

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- GUIDE: MATLAB's tool for building an event-based GUI
- Callback function model
- Using callbacks to respond to events such as mouse clicks and key presses
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Graphical User Interface (GUI)

- In general, the scheme of interaction that a program presents to its users through keyboard characters, mouse clicks or screen touches is called its **Graphical User Interface (GUI)**.
- Traditional GUIs running on PCs etc utilize mouse and keyboard input to let you interact with buttons, menus and other GUI features and such a feature is called a **GUI control** or **widget**.

Event-based User Interfaces

- Operating system dependency
- Programming languages: no built in support for GUI development
- Integrated Development Environment (IDE)
 - Function library, set of tools (GUI Libraries)
- Common characteristic of GUI libraries is **event-based programming**

Event-based User Interfaces

Event-based programming

- During normal operation the GUI sits idle waiting for events
- An event is caused by a user action (clicking on a button, pressing a key on the keyboard, moving a mouse etc)
- Actions cause an event that the GUI will react to. Each event has
 - an **event handler**; also called a **callback function**

The MATLAB GUIDE

- GUIDE: acronym for Graphical User Interface Development Environment
- GUIDE itself is a MATLAB GUI.
- It created two files
 - .fig file (graphical aspects of your GUI)
 - .m file (initializes the GUI and defines the callback functions)
- Started by typing **guide** in the command window

Starting GUIDE



The image shows the MATLAB R2014b environment. The top ribbon includes tabs for HOME, PLOTS, and APPS. The HOME tab is active, showing various icons for file operations (New Script, New, Open, Compare), variable management (New Variable, Open Variable, Clear Workspace), code execution (Analyze Code, Run and Time, Clear Commands), environment settings (Layout, Set Path), and resources (Help, Community, Request Support, Add-Ons).

The current folder is `C:\Users\Ozlem Birgul\Documents\MATLAB`. The file explorer shows several MATLAB files: `bme266_lab1.m`, `bme266_lab2.m`, `rand_even.m`, `rand_even_mod.m`, and `rand_even_odd.m`.

The Editor window displays the following code in `rand_even_odd.m`:

```
1 function [even_array, odd_array] = rand_even_odd(lb, ub, n)
2
3     even_array = ...
4     odd_array = ...
```

The Command Window shows the command `>> guide` and the output `fx >>`.

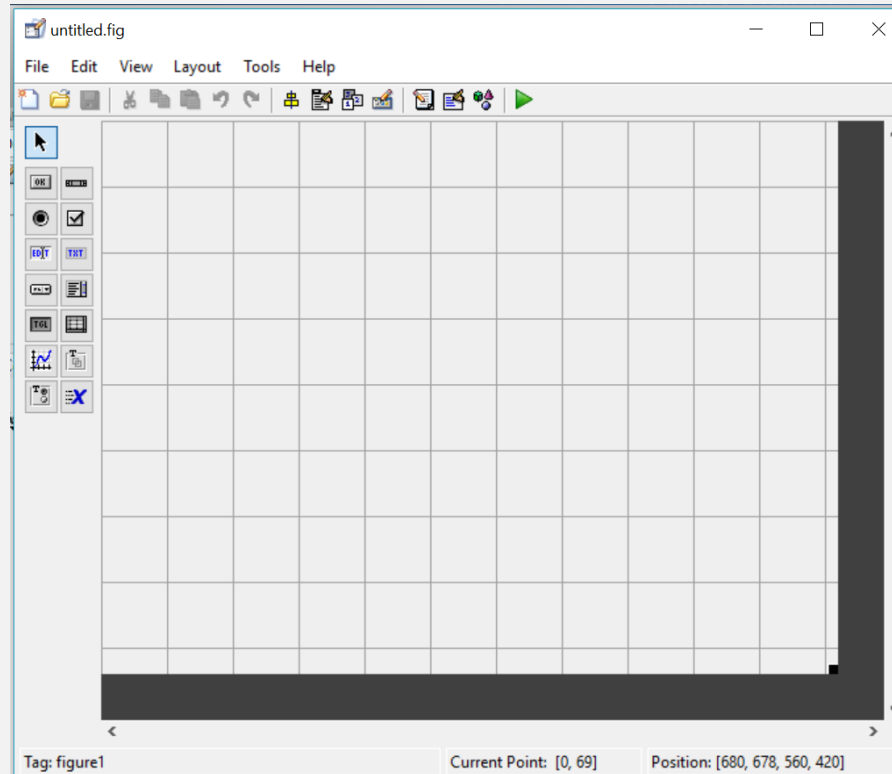
The GUIDE Quick Start dialog box is open, showing the "Create New GUI" tab. The "GUIDE templates" list includes:

- Blank GUI (Default) (selected)
- GUI with Uicontrols
- GUI with Axes and Menu
- Modal Question Dialog

The "Preview" window shows a blank GUI with the text "BLANK".

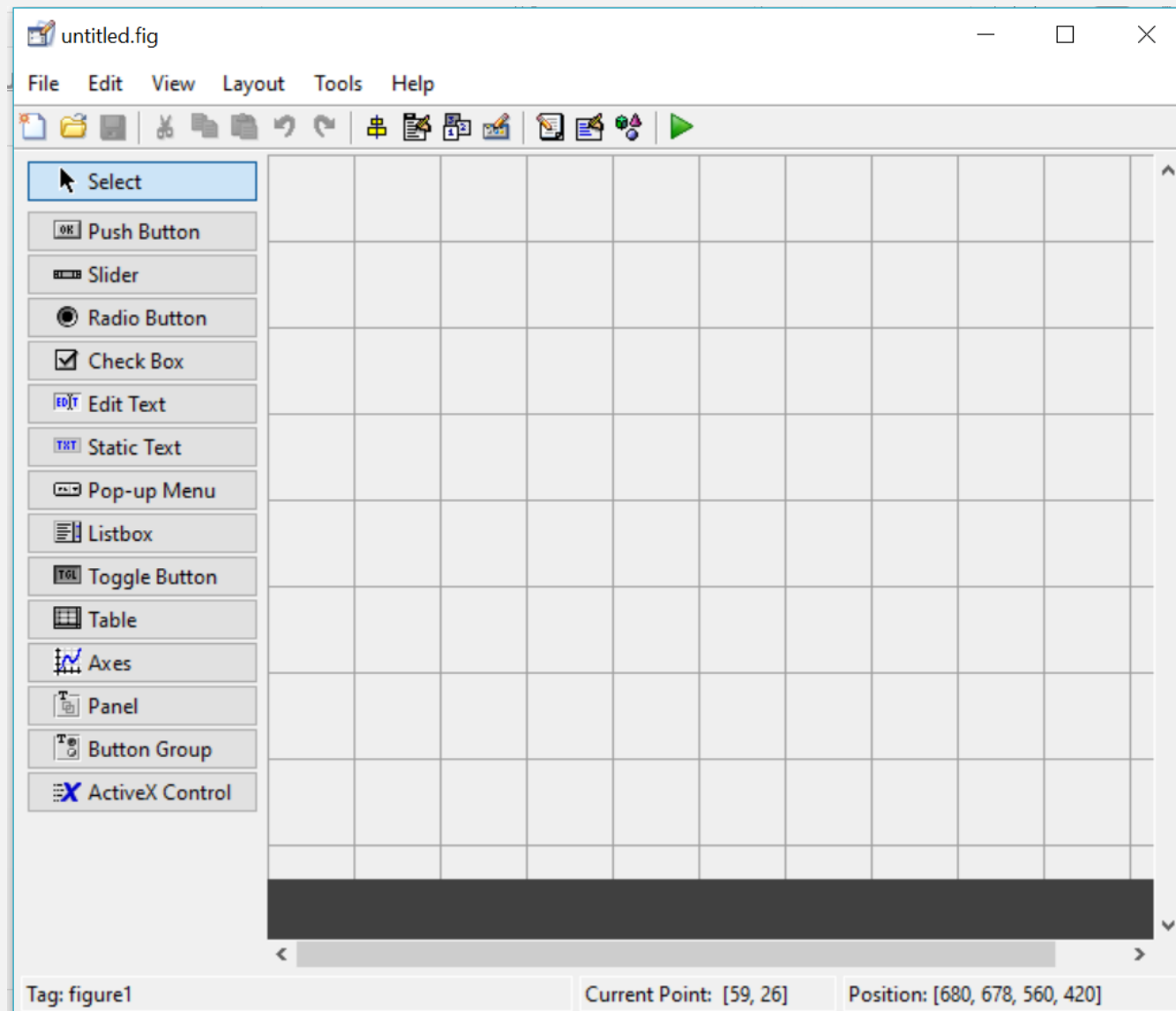
The "Save new figure as:" field is set to `C:\Users\Ozlem Birgul\Documents\MATLAB`. The dialog has "OK", "Cancel", and "Help" buttons.

Blank GUI design



- To see full names of widgets
 - File -> Preferences -> Show names in component palette

Blank GUI design



Definitions of Widgets

- Push button
- Slider
- Radio button
- Check box
- Edit Text Box
- Static Text
- Pop-up Menu
- List Box
- Toggle Button
- Table
- Axes
- Panel
- Button Group

Example GUI

- Placing objects on Canvas
- Property Inspector
- Structure of the .m file
- Adding code to callback functions
- `hObject` handle
- `handles` structure
- Sharing data using function
 - `guidata(hObject,handles)` command