MATLAB GUIDE To App Designer GUI Migration For High Level Applications

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Introduction

This summer I got the great opportunity to intern with Stanford Linear Accelerator Center (SLAC) and work with the High Level Applications team.

At LCLS, the electron beam is controlled and monitored mainly using MATLAB Graphical User Interface (GUIs). This electron beam is used to generate Free Electron Laser (FEL). The fully functionality of the GUIs is of utmost importance. I mainly investigated the feasibility of transitioning from MATLAB GUIDE to App Designer for the design and maintenance of GUIs .

Keywords: MATLAB, GUI, GUIDE, App Designer

Research

The monitoring and controlling of the electron beam relies on the use of about 40-60 GUIs written with MATLAB GUIDE; GUIDE is the old drag and drop option for the creation of GUIs. Additionally, there are about 201 total *.fig files on the main production directory.

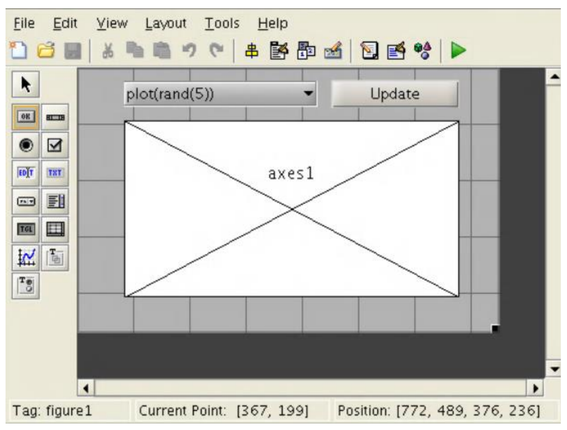

Fig 1. GUIDE Editor

MathWorks officially announced that GUIDE will not be supported in future MATLAB releases, which means that the only alternative for editing GUIs would be to do it programmatically.

In order to still support the drag-and-drop GUI editors, MathWorks released App Designer. Basically, this new editor has all the functionality and GUI components that the old GUIDE had.

It is possible to migrate GUIs from GUIDE to App Designer utilizing the Migration Tool.

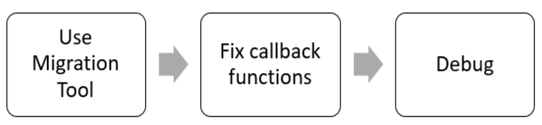

Fig 2. GUI Migration Procedure

Fig. 2 shows the steps taken to migrate the GUI. The extensions of the two files needed to migrate the GUI from GUIDE to App Designer are: *.m and *.fig . Then the Migration Tool outputs a single *.mlapp file that contains the whole GUI.

At first, I had a lot of issues trying to run the GUI after utilizing the Migration Tool; nearly all callback functions had to be manually updated for them to become compatible with the new way that data was being shared within the GUI.

App Designer is more object oriented; the different components and variables needed inside the GUI are now called **properties**.

```
% Properties that correspond to app components
properties (Access = public)
    BSAFigure             matlab.ui.Figure
    variable1             matlab.ui.control.ListBox
    BSA                   matlab.ui.control.Label
    search_string1        matlab.ui.control.EditField
    search_text1          matlab.ui.control.Label
    reset1                matlab.ui.control.Button
    variable2             matlab.ui.control.ListBox
    search_string2        matlab.ui.control.EditField
    search_text2          matlab.ui.control.Label
    reset2                matlab.ui.control.Button
    num_points            matlab.ui.control.EditField
    N_Points_text         matlab.ui.control.Label
    npts_text             matlab.ui.control.Label
    plot_yvsx             matlab.ui.control.Button
    A_vs_Time             matlab.ui.control.Button
    A_PSD                 matlab.ui.control.Button
    save_data_button      matlab.ui.control.Button
    save_as_data_button   matlab.ui.control.Button
    load_data_button      matlab.ui.control.Button
    a_vs_z                matlab.ui.control.Button
    allZtext              matlab.ui.control.Label
    comment_all_z         matlab.ui.control.Label
```

Fig 4. App Designer Properties

These properties must be declared at the beginning of the GUI; this new approach of using data within the GUI is very intuitive. The entire GUI is now a class that can be instantiated.

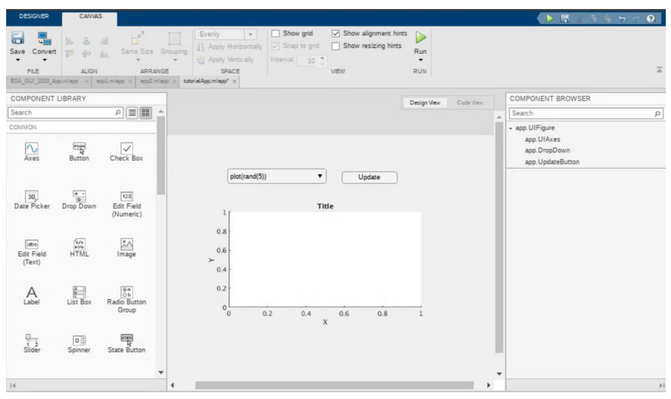

Fig 5. App Designer editor

The new and improved App Designer counts with many more components, such as a lamps, switches, gauges, and rocker switches.

Additionally, a tab to switch between code and design view was added. You are now able to look at all that's happening with your GUI.

The App Designer for the MATLAB 2020a release comes with a very useful feature; this feature allows you to split the GUI into different panels that are later automatically resized to fit the device's screen.

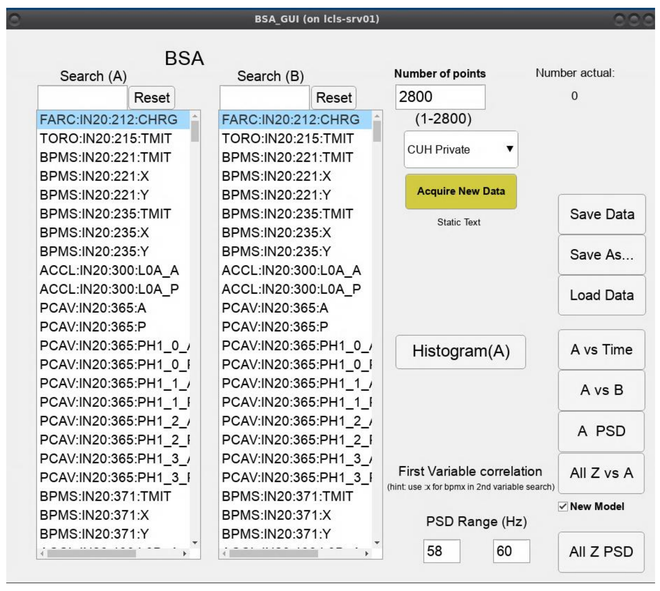

Fig 6. Migrated BSA GUI

Above you can see what a migrated GUI looks like. There is a significant difference between MATLAB 2019 and 2020 Migration Tool. As mentioned before, nearly all callback functions must be manually updated when using the 2019a Migration tool; this is not true for 2020a because MathWorks added a new built-in function that makes the old GUIDE variables compatible with App Designer. Virtually no manual code updates are needed.

Unfortunately, there is not a command to call the Migration Tool from the command window, which means that the process cannot be automated.

Conclusions

GUIs can be migrated from GUIDE to App Designer seamlessly using the MATLAB 2020 Migration Tool. The GUI may need some manual code updated; the migration process cannot be automated.

As a direct result of this project, the High Level Application team decided to transition from 2019a to 2020a.

More work is needed to migrate GUIs and additional testing is required.

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