

# MATLAB GUIDE To App Designer GUI Migration For High Level Applications

Sebastian Bustillo<sup>1</sup>

<sup>1</sup>Ouachita Baptist University

<sup>2</sup>Linac Coherent Light Source, SLAC National Accelerator Laboratory, 2575 Sand Hill Road, Menlo Park, CA 94025, USA.

+Contact: colocho@slac.stanford.edu

Introduction

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



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.

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 corr	espond to app components
roperties (Access = p	ublic)
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

BF BF BF	PMS:IN20:221:Y PMS:IN20:235:TMIT	BPMS:IN20:221:Y BPMS:IN20:235:TMIT	Acquire New Data	
BF BF	PMS:IN20:235:TMIT	BPMS·IN20·235·TMIT		
BF	DMCINDOJZEV	D1 110.11120.200.111111	Statia Taut	Save Data
	PIVIS.IIN20.235.A	BPMS:IN20:235:X	Static text	
BF	PMS:IN20:235:Y	BPMS:IN20:235:Y		Save As
AC	CCL:IN20:300:L0A_A	ACCL:IN20:300:L0A_A		
AC	CCL:IN20:300:L0A_P	ACCL:IN20:300:L0A_P		Load Data
PC	CAV:IN20:365:A	PCAV:IN20:365:A		Load Data
PC	CAV:IN20:365:P	PCAV:IN20:365:P		
PC	CAV:IN20:365:PH1_0_/	PCAV:IN20:365:PH1_0_/	Histogram(A)	A vs Time
PC	CAV:IN20:365:PH1_0_I	PCAV:IN20:365:PH1_0_I	Thistogram(A)	
PC	CAV:IN20:365:PH1_1_/	PCAV:IN20:365:PH1_1_/		A ve B
PC	CAV:IN20:365:PH1_1_I	PCAV:IN20:365:PH1_1_I		AVSD
PC	CAV:IN20:365:PH1_2_/	PCAV:IN20:365:PH1_2_/		
PC	CAV:IN20:365:PH1_2_I	PCAV:IN20:365:PH1_2_I		A PSD
PC	CAV:IN20:365:PH1_3_/	PCAV:IN20:365:PH1_3_/		
PC	CAV:IN20:365:PH1_3_I	PCAV:IN20:365:PH1_3_I	First Variable correlation	All Z vs A
BF	PMS:IN20:371:TMIT	BPMS:IN20:371:TMIT	(hint: use :x for bpmx in 2nd variable search)	
BF	PMS:IN20:371:X	BPMS:IN20:371:X	PSD Range (Hz)	✓ New Model
BF	PMS:IN20:371:Y	BPMS:IN20:371:Y		
	······································	· · · · · · · · · · · · · · · · · · ·	58 60	All Z PSD

#### 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



### 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.

1.00	indeader dationici oationecon	
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.

FILE		A Same Size	Grouping * GE app x tutorialApp.mlapp*	Vertically Inter	Show grid Snap to grid val: 10 VIEV	Show alignment hint Show resizing hints	S Nun Run RUN			Ā
COMPONENT	LIBRARY						Design Mars	California	COMPONENT BROWSE	R
Search		₽ 38	A				Design view	Code wew	Search	q
	(Pupp) T≩ Button								<ul> <li>app.UIFigure</li> <li>app.UIAxes</li> <li>app.DropDown</li> </ul>	
30 Date Picker	Drop Down	Edit Field (Numeric)	1		Title					
Edit Field (Text)	HTML	Image	0.6 > 0.4 0.2							
II 1 2 Slider	0 spinner	State Button		0 0.2	0.4 0 X	.6 0.8	1	1		

Fig 5. App Designer editor

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.

In order to still support the drag-anddrop 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

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.



# Acknowledgments

Use of the Linac Coherent Light Source (LCLS), SLAC National Accelerator Laboratory, is supported by the U.S. Department of Energy, Office of Science, Office of Basic Energy Sciences under Contract No. DE-AC02-76SF00515.

Date: 9/04/2020