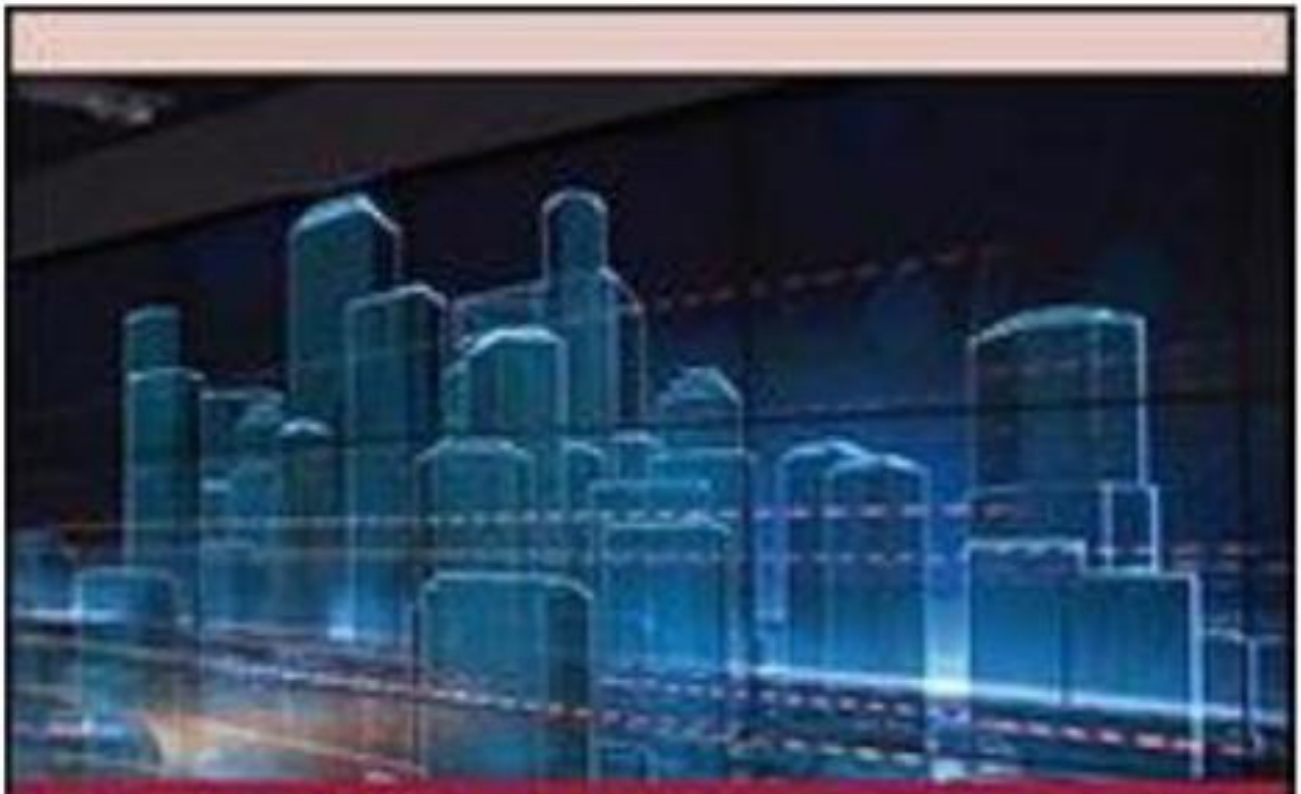

Understanding GUI using MATLAB

for Students

THE X TEAM

Ramesh Manza, Manjiri Patwari
& Yogesh Rajput

SPD

Understanding GUI using MATLAB

for Students

Understanding GUI using MATLAB

for Students

Ramesh Manza, Manjiri Patwari & Yogesh Rajput

SHROFF PUBLISHERS & DISTRIBUTORS PVT. LTD.

Mumbai Bangalore Kolkata New Delhi

Understanding GUI using MATLAB for Students by Ramesh Manza, Manjiri Patwari & Yogesh Rajput

Copyright © 2014, Ramesh Manza

First Indian Reprint: December 2014

ISBN 13: 978-93-5110-000-0

All rights reserved. No part of the material protected by this copyright notice may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, recording, or by any information storage and retrieval system, nor exported, without the written permission of the copyright owner or the publisher.

Published by **Shroff Publishers & Distributors Pvt. Ltd.** C-103, T.T.C. Industrial Area, M.I.D.C., Pawane, Navi Mumbai - 400 703 Tel.: (91-22) 4158 4158 Fax: (91-22) 4158 4141 E-mail: spdorders@ shroffpublishers.com. Web: www.shroffpublishers.com CIN: U22200MH1992PTC067760 Printed at Repro India Ltd., Navi Mumbai.

Dedicated to

All Researchers working in

Digital Image Processing Using MATLAB

Foreword

We are very happy to bring book on Understanding Graphical User Interface (GUI) Using MATLAB, which is specially designed for new students, academicians and researcher scholars working in the area of Digital Image Processing (DIP) Using MATLAB. This book provided detailed information about concept, application and its use to develop graphical user interactive interface in MATLAB. GUI in MATLAB environment is getting popularity due to its long history, and thus it is well developed and well tested. People trust its answers. Its popularity is also due to its friendly user interface environment, which provides an easy-to-use inter¬active environment that includes extensive numerical computation and visualization capabilities. Its compactness is a big advantage. For example, you can solve a set of many DIP complex problems with just few lines of steps and code, a feat that is impossible with traditional programming languages. GUI in MATLAB is also extensible because it can be used to design GUI in various application areas to add new commands, menu driven steps and capabilities. GUI in MATLAB is compatible across almost all platforms, which enables users to share their programs, insights, and ideas.

This book is attributed towards introductory course in Basics of GUI in MATLAB and to covers few advanced topics with respective applications. The emphasis is given on how to use GUI in MATLAB software for user applications. This book will help to learn about how to handle MATLAB for GUI as basic tool to design interactive interfaces for programming, image processing, signal processing, Simulink, Remote Sensing, Neural Network, Fuzzy Logic, Bio-Informatics, Bio-Technology, Data Mining, Big Data analysis etc. Every chapter begins with introductory remark about its contents. The measure contents of all chapters consist of theory, syntax and example and followed by graphical user interface application. Every chapter is ended with detail summary and exercise for the reader to have good practice and get mastery in GUI.

This book is developed using MATLAB Software. It is useful for the beginner to start with the simple steps and reach to the advanced level. If you've never used GUI in MATLAB before, the First chapter will help you to get started. If you're already familiar with GUI in MATLAB, you can glance over most of the think of First chapter quickly.

Preface

Graphical User Interface (GUI) using MATLAB is a book for an introductory course in Basic Matlab for developing GUI and to covers few advanced topics. The emphasis is given on how to design GUI in Matlab software for user applications. This book will help to learn about how to develop user friendly and more interactive GUI in Matlab with the help of basic tool along with programming, graphical user interface, image processing, signal processing and Simulink etc. Every chapter begins with introductory remarks about its contents. The measure contents of all chapters consist of theory, syntax and example along with developed GUI. Every chapter is ended with detail summary and exercise for the reader. The major topics include are:

Chapter 1. Introduction

Chapter 2. About GUI

Chapter 3. Basic GUI Components Demos in MATLAB

Chapter 4. Advanced GUI Components Demos in MATLAB

Chapter 5. Preprocessing Operations on Image

Chapter 6. Basic Operations GUI Demos by using Menu editor in MATLAB

Chapter 7. Advanced Operations GUI Demos by using Menu editor in MATLAB

This book is developed using latest MATLAB Software. The examples are upper compatible to MATLAB versions. It is useful for the beginner to learn basics of GUI and start with the simple GUI steps and reach to the advanced level to design their own application interface. If you've never used Matlab before, the First chapter will help you to get understanding the basics of GUI and started slowly to its advanced step. If you're already familiar with GUI in Matlab, you can glance over most of the think of First chapter quickly.

This book is useful for the degree and post graduate courses to learn and to get mastery in Matlab for designing their interactive user environments. Contents of this book can use directly for one semester. This book is very much useful for engineering, mathematics, and scientific communities those who are going to develop menu driven tool for their projects.

Many colleges now require a course based entirely or in part on GUI in MATLAB early in the curriculum. Most of programmers develop their GUI using front end applications like Visual Basics, .Net, Java etc and actuals image processing part in MATLAB. They have handle interface complexity between MATLAB and other font ends. So, for such user community this is very

much useful because it gives two in one. Computational tools along with GUI helps them to have very good user friendly interactive interface.

The popularity of GUI in MATLAB is partly due to its long history, and thus it is well developed and well tested. People trust its answers. Its popularity is also due to its user interface, which provides an easy-to-use interactive environment that includes extensive numerical computation and visualization capabilities. Its compactness is a big advantage. For example, you can solve a set of many linear algebraic equations, DIP, DSP, NN etc with just few lines of code, a feat that is impossible with traditional programming languages. MATLAB is also extensible; currently more than 100 "toolboxes" in various application areas can be used with MATLAB to add new commands and capabilities. GUI in MATLAB is compatible across almost all platforms, which enables users to share their programs, insights, and ideas. This text is based on MATLAB R2012a.

Acknowledgments

We are very much thankful to all the Faculty Members and authorities of our University and Department of Computer Science and Information Technology, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (MS) India, for providing us all the support to come up with this nice content. We are especially thankful to Dr. K. V. Kale sir for his encouragement, motivation, inspiration and continuous support while writing this book. We are also thankful to Dr. S. C. Mehrotra sir who is the main backbone to make this idea of writing of book into reality. We are really grateful to our all faculty members, research students and PG students for giving good examples and ideas which has directly contributed to enhance the quality of materials. At last but not the least we are very much thankful to our all friends who have read the initial contents and continuously given us their valuable suggestions and feedback. We are also very much thankful to Shroff publishers, without their support it could hardly possible to complete this work. We are really grateful to Matworks for giving us the access of all most literature.

Table of Content

Preface ..... **v**

Acknowledgements ..... **vi**

CHAPTER 1: INTRODUCTION **1**

1.1 Start MATLAB 1

1.2 Introduction to GUI 2

1.3 GUI Work 2

1.4 Start GUI 3

1.5 How Build MATLAB GUIs 4

1.6 Types of GUI's 4

1.7 Development Environment: 5

CHAPTER 2: ABOUT GUI **23**

2.1 GUI layout tools: GUI tools include 24

2.2 About Property Inspector: 25

2.3 Alignment tool: 32

2.4 Object Browser: 35

2.5 The Menu Editor: 36

CHAPTER 3: BASIC GUI COMPONENTS DEMOS IN MATLAB **45**

3.1 Button and Edit Text: 46

3.2 Listbox: 63

3.3 Radio Button: 69

3.4 Uitable: 78

3.5 Checkbox: 84
3.6 Slider Demo: 93
3.7 Popupmenu Demo: 99
3.8 Toggle Button: 106
3.9 Browse Button: 112

CHAPTER 4: ADVANCED GUI COMPONENTS DEMOS IN MATLAB 121
4.1 Image Popupmenu 122
4.2 Image Histogram 129
4.3 Convert Color Image Gray: 140
4.4 Threshold 149
4.5 Color Channel Separation: 158
4.6 Image Enhancement 167
4.7 Image Adjustment: 176
4.8 Feature Extraction: 184
4.9 Image Complement: 192

CHAPTER 5: PREPROCESSING OPERATIONS ON IMAGE 203
5.1 Image Enhancement by using Adaptive .. Histogram Equalization 204
5.2 Comparison of Image Enhancement by its Histogram 213
5.3 Contrast Stretching 221
5.4 Add Disk Noise: 230

5.5 Add and Remove Noise 239
5.6 Sharpen the Image 247

CHAPTER 6: BASIC OPERATIONS GUI DEMOS BY USING MENU EDITOR IN MATLAB 257

6.1 Open and Save Image using File option 263
6.2 Add Image Names in Popup Menu 271
6.3 Display Images in Axes 281
6.4 Add Table in uitable 292
6.5 Load Excel Sheet in uitable 298
6.6 Arithmetic operation using Edit Text 304

CHAPTER 7: ADVANCED OPERATIONS GUI DEMOS BY USING MENU EDITOR IN MATLAB 315

7.1 Color Image to Gray and Apply Color Map: 316
7.2 Color Channel Separation with Histogram 325
7.3 Image Enhancement using Histogram Equalization, Adaptive Histogram Equalization, Intensity Transformation and Contrast Stretching 335
7.4 Edge Detection Filters 350
7.5 Image Enhancement using Filters 363
7.6 Perform Threshold Operation on Images and Plot Boundaries 376
7.7 Get Image Pixel Value in uitable 384