

# Digital Image Processing Using LabView

Rubén Posada-Gómez,  
Oscar Osvaldo Sandoval-González, Albino Martínez Sibaja,  
Otniel Portillo-Rodríguez and Giner Alor-Hernández,  
*Instituto Tecnológico de Orizaba, Departamento de Postgrado e Investigación,  
México*

## 1. Introduction

Digital Image processing is a topic of great relevance for practically any project, either for basic arrays of photodetectors or complex robotic systems using artificial vision. It is an interesting topic that offers to multimodal systems the capacity to see and understand their environment in order to interact in a natural and more efficient way.

The development of new equipment for high speed image acquisition and with higher resolutions requires a significant effort to develop techniques that process the images in a more efficient way. Besides, medical applications use new image modalities and need algorithms for the interpretation of these images as well as for the registration and fusion of the different modalities, so that the image processing is a productive area for the development of multidisciplinary applications.

The aim of this chapter is to present different digital image processing algorithms using LabView and IMAQ vision toolbox. IMAQ vision toolbox presents a complete set of digital image processing and acquisition functions that improve the efficiency of the projects and reduce the programming effort of the users obtaining better results in shorter time. Therefore, the IMAQ vision toolbox of LabView is an interesting tool to analyze in detail and through this chapter it will be presented different theories about digital image processing and different applications in the field of image acquisition, image transformations.

This chapter includes in first place the image acquisition and some of the most common operations that can be locally or globally applied, the statistical information generated by the image in a histogram is commented later. Finally, the use of tools allowing to segment or filtrate the image are described making special emphasis in the algorithms of pattern recognition and matching template.

## 2. Digital image acquisition

We generally associate the image to a representation that we make in our brain according to the light incidence into a scene (Bischof & Kropatsch, 2001). Therefore, there are different variables related to the formation of images, such as the light distribution in the scene. Since the image formation depends of the interaction of light with the object in the scene and the emitted energy from one or several light sources changes in its trip (Fig. 1). That is why the

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International Conference on Innovative Computing and Communications Deepak Gupta, Ashish Khanna, Siddhartha Bhattacharyya, Aboul Ella Hassanien, Sameer Anand, Ajay Jaiswal, 2022-09-22 This book includes high quality research papers presented at the Fifth International Conference on Innovative Computing and Communication ICICC 2022 which is held at the Shaheed Sukhdev College of Business Studies University of Delhi Delhi India on February 19 20 2022 Introducing the innovative works of scientists professors research scholars students and industrial experts in the field of computing and communication the book promotes the transformation of fundamental research into institutional and industrialized research and the conversion of applied exploration into real time applications

PEM Fuel Cells Jasna Jankovic, Jürgen Stumper, 2023-05-22 This book is a comprehensive introduction to the rapidly developing field of modeling and characterization of PEM fuel cells It focuses on i fuel cell performance modeling and performance characterization applicable from single cells to stacks ii fundamental and advanced techniques for structural and compositional characterization of fuel cell components and iii electrocatalyst design Written by experts in this field this book is an invaluable tool for graduate students and professionals

**Digital Image Processing Using LabVIEW** Rubén Posada-Gómez, 2011 Digital Image Processing Using LabVIEW *Implementation of digital image processing functions using LabVIEW* George Costaki Panayi, 1999

**Image Acquisition and Processing with LabVIEW** Christopher G. Relf, 2003-07-28 Image Acquisition and Processing With LabVIEW combines the general theory of image acquisition and processing the underpinnings of LabVIEW and the NI Vision toolkit examples of their applications and real world case studies in a clear systematic and richly illustrated presentation Designed for LabVIEW programmers it fills a significant gap in the technical literature by providing a general training manual for those new to National Instruments NI Vision application development and a reference for more experienced vision programmers The downloadable resources contain libraries of the example images and code referenced in the text additional technical white papers a demonstration version of LabVIEW 6 0 and an NI IMAQ demonstration that guides you through its features System Requirements Using the code provided on the downloadable resources requires LabVIEW 6 1 or higher and LabVIEW Vision Toolkit 6 1 or higher Some of the examples also require IMAQ Vision Builder 6 1 or higher the IMAQ OCR toolkit and IMAQ 1394 drivers

*Image Processing with LabVIEW and IMAQ Vision* Thomas Klinger, 2003 This book shows how LabVIEW and especially IMAQ Vision can be used for the realization of common image processing tasks It covers key issues like image distribution and generation and technologies such as FireWire and Camera Link are discussed in depth

**Digital Image Processing with Matlab and Labview** Vipula Singh, 2013 Digital Image Processing using SCILAB Rohit M. Thanki, Ashish M. Kothari, 2018-05-07 This book provides basic theories and implementations using SCILAB open source software for digital images The book simplifies image processing theories and well as implementation of image processing algorithms making it accessible to those with basic knowledge of image

processing This book includes many SCILAB programs at the end of each theory which help in understanding concepts The book includes more than sixty SCILAB programs of the image processing theory In the appendix readers will find a deeper glimpse into the research areas in the image processing Optical and Digital Image Processing Gabriel Cristobal, Peter Schelkens, Hugo Thienpont, 2013-02-12 In recent years Moore's law has fostered the steady growth of the field of digital image processing though the computational complexity remains a problem for most of the digital image processing applications In parallel the research domain of optical image processing has matured potentially bypassing the problems digital approaches were suffering and bringing new applications The advancement of technology calls for applications and knowledge at the intersection of both areas but there is a clear knowledge gap between the digital signal processing and the optical processing communities This book covers the fundamental basis of the optical and image processing techniques by integrating contributions from both optical and digital research communities to solve current application bottlenecks and give rise to new applications and solutions Besides focusing on joint research it also aims at disseminating the knowledge existing in both domains Applications covered include image restoration medical imaging surveillance holography etc a very good book that deserves to be on the bookshelf of a serious student or scientist working in these areas Source Optics and Photonics News

**Real-Time Image and Video Processing** Nasser Kehtarnavaz, Mark Gamadia, 2022-06-01 This book presents an overview of the guidelines and strategies for transitioning an image or video processing algorithm from a research environment into a real time constrained environment Such guidelines and strategies are scattered in the literature of various disciplines including image processing computer engineering and software engineering and thus have not previously appeared in one place By bringing these strategies into one place the book is intended to serve the greater community of researchers practicing engineers industrial professionals who are interested in taking an image or video processing algorithm from a research environment to an actual real time implementation on a resource constrained hardware platform These strategies consist of algorithm simplifications hardware architectures and software methods Throughout the book carefully selected representative examples from the literature are presented to illustrate the discussed concepts After reading the book the readers are exposed to a wide variety of techniques and tools which they can then employ to design a real time image or video processing system

**Digital Image Processing** Uvais Qidwai, C.H. Chen, 2009-10-15 Avoiding heavy mathematics and lengthy programming details Digital Image Processing An Algorithmic Approach with MATLAB presents an easy methodology for learning the fundamentals of image processing The book applies the algorithms using MATLAB without bogging down students with syntactical and debugging issues One chapter can typically be completed per week with each chapter divided into three sections The first section presents theoretical topics in a very simple and basic style with generic language and mathematics The second section explains the theoretical concepts using flowcharts to streamline the concepts and to form a foundation for students to code in any programming language The

final section supplies MATLAB codes for reproducing the figures presented in the chapter Programming based exercises at the end of each chapter facilitate the learning of underlying concepts through practice This textbook equips undergraduate students in computer engineering and science with an essential understanding of digital image processing It will also help them comprehend more advanced topics and sophisticated mathematical material in later courses A color insert is included in the text while various instructor resources are available on the author s website

*Digital Image Processing: Practical Approach* Borko Furht, Esad Akar, Whitney Angelica Andrews, 2018-08-28 The SpringerBrief covers fundamentals of digital image processing including image concept image file formats creating user interfaces and many practical examples of processing images using C and Java These practical examples include among other creating image histograms performing lossless image compression detecting change in colors similarity based image retrieval and others All practical examples are accompanied with an explanation how to create programs and the obtained results This SpringerBrief can be very useful for the undergraduate courses on image processing providing students with the basic tools in image analysis and processing Practitioners and researchers working in this field will also find this research useful

Digital Image Processing William K. Pratt, 2007-03-31 A newly updated and revised edition of the classic introduction to digital image processing The Fourth Edition of Digital Image Processing provides a complete introduction to the field and includes new information that updates the state of the art The text offers coverage of new topics and includes interactive computer display imaging examples and computer programming exercises that illustrate the theoretical content of the book These exercises can be implemented using the Programmer s Imaging Kernel System PIKS application program interface included on the accompanying CD Suitable as a textbook for students or as a reference for practitioners this new edition provides a comprehensive treatment of these vital topics Characterization of continuous images Image sampling and quantization techniques Two dimensional signal processing techniques Image enhancement and restoration techniques Image analysis techniques Software implementation of image processing applications In addition the bundled CD includes A Solaris operating system executable version of the PIKS Scientific API A Windows operating system executable version of PIKS Scientific A Windows executable version of PIKSTool a graphical user interface method of executing many of the PIKS Scientific operators without program compilation A PDF file format version of the PIKS Scientific C programmer s reference manual C program source demonstration programs A digital image database of most of the source images used in the book plus many others widely used in the literature Note CD ROM DVD and other supplementary materials are not included as part of eBook file

**Advanced Digital Image Processing and Its Applications in Big Data** Ankur Dumka, Alaknanda Ashok, Parag Verma, Poonam Verma, 2020-12-09 This book covers the technology of digital image processing in various fields with big data and their applications Readers will understand various technologies and strategies used in digital image processing as well as handling big data using machine learning techniques This book will help to improve the skills of students and researchers in such fields as engineering

agriculture and medical imaging There is a need to be able to understand and analyse the latest developments of digital image technology As such this book will cover Applications such as biomedical science and biometric image processing content based image retrieval remote sensing pattern recognition shape and texture analysis New concepts in color interpolation to produce the full color from the sub pattern bare pattern color prevalent in today s digital cameras and other imaging devices Image compression standards that are needed to serve diverse applications Applications of remote sensing medical science traffic management education innovation and analysis in agricultural design and image processing Both soft and hard computing approaches at great length in relation to major image processing tasks The direction and development of current and future research in many areas of image processing A comprehensive bibliography for additional research integrated within the framework of the book This book focuses not only on theoretical and practical knowledge in the field but also on the traditional and latest tools and techniques adopted in image processing and data science It also provides an indispensable guide to a wide range of basic and advanced techniques in the fields of image processing and data science

**Practical Digital Image Processing** Rhys Lewis,1990 Aims to bridge a gap between introductory texts on image processing and more specialist works which contain considerable amounts of complex mathematics Emphasis is placed on the selection and use of techniques rather than their implementation

**Fundamentals of Digital Image Processing** Chris Solomon,Toby Breckon,2011-07-05 This is an introductory to intermediate level text on the science of image processing which employs the Matlab programming language to illustrate some of the elementary key concepts in modern image processing and pattern recognition The approach taken is essentially practical and the book offers a framework within which the concepts can be understood by a series of well chosen examples exercises and computer experiments drawing on specific examples from within science medicine and engineering Clearly divided into eleven distinct chapters the book begins with a fast start introduction to image processing to enhance the accessibility of later topics Subsequent chapters offer increasingly advanced discussion of topics involving more challenging concepts with the final chapter looking at the application of automated image classification with Matlab examples Matlab is frequently used in the book as a tool for demonstrations conducting experiments and for solving problems as it is both ideally suited to this role and is widely available Prior experience of Matlab is not required and those without access to Matlab can still benefit from the independent presentation of topics and numerous examples Features a companion website [www.wiley.com/go/solomon\\_fundamentals](http://www.wiley.com/go/solomon_fundamentals) containing a Matlab fast start primer further exercises examples instructor resources and accessibility to all files corresponding to the examples and exercises within the book itself Includes numerous examples graded exercises and computer experiments to support both students and instructors alike

Introduction to Digital Image Processing William K. Pratt,2013-09-13 The subject of digital image processing has migrated from a graduate to a junior or senior level course as students become more proficient in mathematical background earlier in their college education With that in mind Introduction to Digital Image

Processing is simpler in terms of mathematical derivations and eliminates derivations of advanced s

**Principles of Digital Image Processing** Dr. D. Rajasekhar, Dr. Rashmi, Mr. R.A. Manoj Kumar, S. Dhanalakshmi, 2024-10-18 Principles of Digital Image Processing the techniques and methodologies used in the manipulation and analysis of digital images The fundamental concepts of image representation enhancement restoration and transformation providing readers with a solid understanding of how digital images are processed The book emphasizes both theoretical principles and practical applications making it an essential resource for students researchers and professionals in the fields of computer vision machine learning and digital media

Digital Image Processing for Medical Applications Geoff Dougherty, 2009-04-09 Hands on text for a first course aimed at end users focusing on concepts practical issues and problem solving

Image Processing Tinku Acharya, Ajoy K. Ray, 2005-09-08 Image processing from basics to advanced applications Learn how to master image processing and compression with this outstanding state of the art reference From fundamentals to sophisticated applications Image Processing Principles and Applications covers multiple topics and provides a fresh perspective on future directions and innovations in the field including Image transformation techniques including wavelet transformation and developments Image enhancement and restoration including noise modeling and filtering Segmentation schemes and classification and recognition of objects Texture and shape analysis techniques Fuzzy set theoretical approaches in image processing neural networks etc Content based image retrieval and image mining Biomedical image analysis and interpretation including biometric algorithms such as face recognition and signature verification Remotely sensed images and their applications Principles and applications of dynamic scene analysis and moving object detection and tracking Fundamentals of image compression including the JPEG standard and the new JPEG2000 standard Additional features include problems and solutions with each chapter to help you apply the theory and techniques as well as bibliographies for researching specialized topics With its extensive use of examples and illustrative figures this is a superior title for students and practitioners in computer science wireless and multimedia communications and engineering

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