

**CSCE 5683 – Digital Image Processing**  
**Final Exam – Spring 2009**

**Instructions:**

- This is a two-hour closed book final exam.
- You are allowed one 8.5x11 page of notes.
- Answer all of the questions below.

**Question #1**

- Describe how histogram equalization operates. Be specific about the algorithm and use equations and diagrams as necessary to explain how this technique works.
- Apply histogram equalization to the 5x5 image below to perform image enhancement. You are welcome to use any output pixel range you wish.

2	2	3	9	9
2	2	3	9	9
3	3	3	9	9
9	9	9	9	9
9	9	9	9	8

**Question #2**

The traditional method to implement neighborhood averaging is to perform a convolution with an  $M \times M$  mask of 1's. One way to improve the computation time is to take advantage of the fact that the neighborhood for  $[x+1, y]$  will overlap most of the neighborhood for  $[x, y]$ . Hence, we can calculate the average for pixel  $[x+1, y]$  in terms of the average for pixel  $[x, y]$  plus  $M$  pixels that are added to the right side of the  $[x+1, y]$  region, minus  $M$  pixels that are removed from the left side of the  $[x, y]$  region.

- How many operations are needed to calculate each output value using the traditional neighborhood averaging for  $M \times M$  masks as  $M$  varies from 1 to 10?
- How many operations are needed to implement the fancy neighborhood averaging algorithm described above as  $M$  varies from 1 to 10?
- Do you think this approach can be used for any convolution operation? Explain why or why not.
- Do you think this approach can be extended to work for median filtering? Explain why or why not.

# Digital Image Processing Exam Solution

**J Dewey**



## **Digital Image Processing Exam Solution:**

**Digital Image Processing MCQs** Arshad Iqbal, 2019-06-14 Digital Image Processing Multiple Choice Questions and Answers MCQs Digital image processing quiz questions and answers with practice tests for online exam prep and job interview prep Digital image processing study guide with questions and answers about color image processing digital image fundamentals filtering in frequency domain image compression image restoration and reconstruction image segmentation intensity transformation and spatial filtering introduction to digital image processing morphological image processing wavelet and multi resolution processing Digital image processing trivia questions and answers to get prepare for career placement tests and job interview prep with answers key Practice exam questions and answers about computer science composed from digital image processing textbooks on chapters Color Image Processing Practice Test 50 MCQs Digital Image Fundamentals Practice Test 50 MCQs Filtering in Frequency Domain Practice Test 50 MCQs Image Compression Practice Test 50 MCQs Image Restoration and Reconstruction Practice Test 50 MCQs Image Segmentation Practice Test 150 MCQs Intensity Transformation and Spatial Filtering Practice Test 50 MCQs Introduction to Digital Image Processing Practice Test 50 MCQs Morphological Image Processing Practice Test 50 MCQs Wavelet and Multi resolution Processing Practice Test 50 MCQs Digital image processing interview questions and answers on 10d discrete Fourier transform background of intensity transformation basic edge detection basic intensity transformations functions basics of filtering in frequency domain basics of full color image processing bit plane slicing coding redundancy color fundamentals in color image processing color model in color image processing color models color models in color image processing color transformation constrained least squares filtering contrast stretching convolution color fundamentals Digital image processing test questions and answers on discrete Fourier transform of one variable edge detection in image processing edge detection in segmentation edge models in digital image processing edge models in image segmentation elements of visual perception erosion and dilation estimating degradation function example of using image processing examples in intensity transformation examples of using modalities extension to functions of two variables fidelity criteria filtering concepts Digital image processing exam questions and answers on fundamental steps in digital image processing fundamentals of image compression fundamentals of image segmentation fundamentals of spatial filtering gamma rays imaging geometric mean filter histogram equalization histogram matching histogram processing hit or miss transformation image compression basics image compression models image compression techniques image compressors image erosion image interpolation and re sampling image interpolation in dip image negatives image processing algorithms image reconstruction from projections image sampling and quantization Digital image processing objective questions and answers on image segmentation basics image sensing and acquisition imaging in a radio wave imaging in microwave band imaging in ultraviolet band imaging in visible and infrared band intensity level slicing introduction to wavelet and multi resolution processing inverse filtering light and electromagnetic spectrum line detection in

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**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

**Signal Processing Exam Study Guide** Cybellium,2024-10-26 Designed for professionals students and enthusiasts alike our comprehensive books empower you to stay ahead in a rapidly evolving digital world Expert Insights Our books provide deep actionable insights that bridge the gap between theory and practical application Up to Date Content Stay current with the latest advancements trends and best practices in IT AI Cybersecurity Business Economics and Science Each guide is regularly updated to reflect the newest developments and challenges Comprehensive Coverage Whether you re a beginner or an advanced learner Cybellium books cover a wide range of topics from foundational principles to specialized knowledge tailored to your level of expertise Become part of a global network of learners and professionals who trust Cybellium to guide their educational journey [www.cybellium.com](http://www.cybellium.com) Digital Image Processing and Analysis Scott E Umbaugh,2022-12-30

Digital Image Enhancement Restoration and Compression focuses on human vision based imaging application development Examples include making poor images look better the development of advanced compression algorithms special effects imaging for motion pictures and the restoration of satellite images distorted by atmospheric disturbance This book presents a unique engineering approach to the practice of digital imaging which starts by presenting a global model to help gain an understanding of the overall process followed by a breakdown and explanation of each individual topic Topics are presented as they become necessary for understanding the practical imaging model under study which provides the reader with the motivation to learn about and use the tools and methods being explored The book includes chapters on imaging systems and software the human visual system image transforms image filtering image enhancement image restoration and image compression Numerous examples including over 700 color images are used to illustrate the concepts discussed Readers can explore their own application development with any programming language including C C MATLAB Python and R and software is provided for both the Windows C C and MATLAB environments The book can be used by the academic community in teaching and research with over 1 000 PowerPoint slides and a complete solutions manual to the over 230 included

problems It can also be used for self study by those involved with application development whether they are engineers scientists or artists The new edition has been extensively updated and includes numerous problems and programming exercises that will help the reader and student develop their skills

### **Digital Image Processing and Pattern**

**Recognition** Pakhira Malay K.,2011-02 This book is designed for undergraduate and postgraduate students of Computer Science and Engineering Information Technology Electronics and Communication Engineering and Electrical Engineering The book comprehensively covers all the important topics in digital image processing and pattern recognition along with the fundamental concepts mathematical preliminaries and theoretical derivations of significant theorems The image processing topics include coverage of image formation digitization lower level processing image analysis image compression and so on The topics on pattern recognition include statistical decision making decision tree learning artificial neural networks clustering and others An application of simulated annealing for edge detection is described in an appendix The book is profusely illustrated with more than 200 figures and sketches as an added feature **KEY FEATURES** Provides a large number of worked examples to strengthen the grasp of the concepts Lays considerable emphasis on the algorithms in order to teach students how to write good practical programs for problem solving Devotes a separate chapter to currently used image format standards Offers problems at the end of each chapter to help students test their understanding of the fundamentals of the subject

**Introduction to Digital Image Processing** Mr. Rohit Manglik,2024-07-28 EduGorilla Publication is a trusted name in the education sector committed to empowering learners with high quality study materials and resources Specializing in competitive exams and academic support EduGorilla provides comprehensive and well structured content tailored to meet the needs of students across various streams and levels

Encyclopedia of Image Processing Phillip A. Laplante,2018-11-08 The Encyclopedia of Image Processing presents a vast collection of well written articles covering image processing fundamentals e g color theory fuzzy sets cryptography and applications e g geographic information systems traffic analysis forgery detection Image processing advances have enabled many applications in healthcare avionics robotics natural resource discovery and defense which makes this text a key asset for both academic and industrial libraries and applied scientists and engineers working in any field that utilizes image processing Written by experts from both academia and industry it is structured using the ACM Computing Classification System CCS first published in 1988 but most recently updated in 2012

Computational Methods in Science and Technology Sukhpreet Kaur,Sushil Kamboj,Manish Kumar,Arvind Dagur,Dhirendra Kumar Shukla,2024-10-10 This book contains the proceedings of the 4TH International Conference on Computational Methods in Science and Technology ICCMST 2024 The proceedings explores research and innovation in the field of Internet of things Cloud Computing Machine Learning Networks System Design and Methodologies Big Data Analytics and Applications ICT for Sustainable Environment Artificial Intelligence and it provides real time assistance and security for advanced stage learners researchers and academicians has been presented This will be a valuable

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**Saving Women's Lives** National Research Council, Institute of Medicine, Policy and Global Affairs, Board on Science, Technology, and Economic Policy, National Cancer Policy Board, Committee on New Approaches to Early Detection and Diagnosis of Breast Cancer, 2005-04-18 The outlook for women with breast cancer has improved in recent years Due to the combination of improved treatments and the benefits of mammography screening breast cancer mortality has decreased steadily since 1989 Yet breast cancer remains a major problem second only to lung cancer as a leading cause of death from cancer for women To date no means to prevent breast cancer has been discovered and experience has shown that treatments are most effective when a cancer is detected early before it has spread to other tissues These two facts suggest that the most effective way to continue reducing the death toll from breast cancer is improved early detection and diagnosis Building on the 2001 report Mammography and Beyond this new book not only examines ways to improve implementation and use of new and current breast cancer detection technologies but also evaluates the need to develop tools that identify women who would benefit most from early detection screening Saving Women's Lives Strategies for Improving Breast Cancer Detection and Diagnosis encourages more research that integrates the development validation and analysis of the types of technologies in clinical practice that promote improved risk identification techniques In this way methods and technologies that improve detection and diagnosis can be more effectively developed and implemented

**IOT with Smart Systems** Tomonobu Senjyu, Parakshit Mahalle, Thinagaran Perumal, Amit Joshi, 2022-01-05 This book gathers papers addressing state of the art research in all areas of information and communication technologies and their applications in intelligent computing cloud storage data mining and software analysis It presents the outcomes of the Fifth International Conference on Information and Communication Technology for Intelligent Systems ICTIS 2021 held in Ahmedabad India The book is divided into two volumes It discusses the fundamentals of various data analysis techniques and algorithms making it a valuable resource for researchers and practitioners alike

**Curriculum Handbook with General Information Concerning ... for the United States Air Force Academy** United States Air Force Academy, 2003      *Examination Review for Radiography* Shelley Giordano, 2013-08 Examination Review for Radiography is an engaging print and online resource that is the perfect way to prepare for the American Registry of Radiologic Technologists ARRT general radiography registry examination Featuring an online exam simulator that contains more than 2 000 multiple choice questions directly correlated to the AART's content specifications Examination Review for Radiography is the only book on the market that makes it possible to take as many as three online 220 question mock registry exams without ever duplicating a question Online practice tests can be timed to simulate the actual three hour certification exam or untimed to help build speed and confidence Also included are a sample



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**Intelligent IT Solutions to Promote Indigenous Innovations** Balvinder Shukla, Mahadeo Jaiswal, Nitasha Hasteer, Rahul Sindhwani, Sangeeta Khorana, 2025-08-02 The proceedings of 6th International Conference on Entrepreneurship Innovation and Leadership ICEIL 2024 would focus on Intelligent IT Solutions to promote indigenous innovations The book will be a catalyst for transformative change inspiring a collective effort towards harnessing the power of technology for sustainable self reliant development This book will be a compilation of latest technological advancements and state of the art research in the emerging technologies like artificial intelligence blockchain internet of things quantum computing etc This book will be useful for students research scholars and practitioners from different disciplines to enhance their knowledge      **Mini-micro Systems**, 1983      World Congress on Medical Physics and Biomedical Engineering September 7 - 12, 2009 Munich, Germany Olaf Dössel, Wolfgang C. Schlegel, 2010-01-04 Present Your Research to the World The World Congress 2009 on Medical Physics and Biomedical Engineering the triennial scientific meeting of the IUPESM is the world's leading forum for presenting the results of current scientific work in health related physics and technologies to an international audience With more than 2 800 presentations it will be the biggest conference in the fields of Medical Physics and Biomedical Engineering in 2009 Medical physics biomedical engineering and bioengineering have been driving

forces of innovation and progress in medicine and healthcare over the past two decades As new key technologies arise with significant potential to open new options in diagnostics and therapeutics it is a multidisciplinary task to evaluate their benefit for medicine and healthcare with respect to the quality of performance and therapeutic output Covering key aspects such as information and communication technologies micro and nanosystems optics and biotechnology the congress will serve as an inter and multidisciplinary platform that brings together people from basic research R D industry and medical application to discuss these issues As a major event for science medicine and technology the congress provides a comprehensive overview and in depth first hand information on new developments advanced technologies and current and future applications With this Final Program we would like to give you an overview of the dimension of the congress and invite you to join us in Munich

Olaf D ssel Congress President Wolfgang C      **Official Gazette of the United States Patent and Trademark Office**  
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### **Digital Image Processing Exam Solution Introduction**

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