Image Processing And Acquisition Using Python Chapman Hallcrc Mathematical And Computational Imaging Sciences Series

This textbook presents the fundamental concepts and methods for understanding and working with images and video in an unique, easy-to-read style which ensures the material is accessible to a wide audience. Exploring more than just the basics of image processing, the text provides a specific focus on the practical design and implementation of real systems for processing video data. Features: includes more than 100 exercises, as well as C-code snippets of the key algorithms; covers topics on image acquisition, color images, point processing, neighborhood processing, morphology, BLOB analysis, segmentation in video, tracking, geometric transformation, and visual effects; requires only a minimal understanding of mathematics; presents two chapters dedicated to applications; provides a guide to defining suitable values for parameters in video and image processing systems, and to conversion between the RGB color representation and the HIS, HSV and YUV/YCbCr color representations. Variational Methods in Image Processing presents the principles, techniques, and applications of variational image processing. The text focuses on variational models, their corresponding Euler-Lagrange equations, and numerical implementations for

image processing. It balances traditional computational models with more modern techniques that solve t

As modern technologies continue to develop and evolve, the ability of users to interface with new systems becomes a paramount concern. Research into new ways for humans to make use of advanced computers and other such technologies is necessary to fully realize the potential of 21st century tools. Human-Computer Interaction: Concepts, Methodologies, Tools, and Applications gathers research on user interfaces for advanced technologies and how these interfaces can facilitate new developments in the fields of robotics, assistive technologies, and computational intelligence. This four-volume reference contains cutting-edge research for computer scientists; faculty and students of robotics, digital science, and networked communications; and clinicians invested in assistive technologies. This seminal reference work includes chapters on topics pertaining to system usability, interactive design, mobile interfaces, virtual worlds, and more.

This long-established and well-received monograph offers an integral view of image processing - from image acquisition to the extraction of the data of interest – written by a physical scientists for other scientists. Supplements discussion of the general concepts is supplemented with examples from applications on PC-based image processing systems and ready-to-use implementations of important algorithms. Completely revised and extended, the most notable extensions being a detailed

discussion on random variables and fields, 3-D imaging techniques and a unified approach to regularized parameter estimation.

Image Acquisition and Processing With LabVIEWä 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 recognition has become an increasingly dynamic field with new and emerging civil and military applications in security, exploration, and robotics. Written by experts in fractal-based image and video compression, A Concise Introduction to Image Processing using C++ strengthens your knowledge of fundamentals principles in image acquisition, con

A straightforward introduction to basic concepts and methodologies for digital photoelasticity, providing a foundation on which future researchers and students can develop their own ideas. The book thus promotes research into the formulation of problems in digital photoelasticity and the application of these techniques to industries. In one volume it provides data acquisition by DIP techniques, its analysis by statistical techniques, and its presentation by computer graphics plus the use of rapid prototyping technologies to speed up the entire process. The book not only presents the various techniques but also provides the relevant time-tested software codes. Exercises designed to support and extend the treatment are found at the end of each chapter. The popularity of magnetic resonance (MR) imaging in medicine is no mystery: it is non-invasive, it produces high quality structural and functional image data, and it is very versatile and flexible. Research into MR technology is advancing at a blistering pace, and modern engineers must keep up with the latest developments. This is only possible with a firm grounding in the basic principles of MR, and Advanced Image Processing in Magnetic Resonance Imaging solidly integrates this foundational knowledge with the latest advances in the field. Beginning with the basics of signal and image generation and reconstruction, the book covers in detail the signal processing techniques and algorithms, filtering techniques for MR images, quantitative analysis including image registration and integration of EEG and MEG techniques with MR, and MR spectroscopy techniques. The final section of the book explores functional MRI (fMRI)

in detail, discussing fundamentals and advanced exploratory data analysis, Bayesian inference, and nonlinear analysis. Many of the results presented in the book are derived from the contributors' own work, imparting highly practical experience through experimental and numerical methods. Contributed by international experts at the forefront of the field, Advanced Image Processing in Magnetic Resonance Imaging is an indispensable guide for anyone interested in further advancing the technology and capabilities of MR imaging.

The fields of computer vision and image processing are constantly evolving as new research and applications in these areas emerge. Staying abreast of the most up-to-date developments in this field is necessary in order to promote further research and apply these developments in real-world settings. Computer Vision and Image Processing in Intelligent Systems and Multimedia Technologies features timely and informative research on the design and development of computer vision and image processing applications in intelligent agents as well as in multimedia technologies. Covering a diverse set of research in these areas, this publication is ideally designed for use by academicians, technology professionals, students, and researchers interested in uncovering the latest innovations in the field.

Few fields have witnessed such impressive advances as the application of

computer technology to radiology. The progress achieved has revolutionized diagnosis and greatly facilitated treatment selection and accurate planning of procedures. This book, written by leading experts from many different countries, provides a comprehensive and up-to-date overview of the role of 3D image processing. The first section covers a wide range of technical aspects in an informative way. This is followed by the main section, in which the principal clinical applications are described and discussed in depth. To complete the picture, the final section focuses on recent developments in functional imaging and computer-aided surgery. This book will prove invaluable to all who have an interest in this complex but vitally important field.

In light of the revolution in imaging technology, this book brings image acquisition and processing capabilities within the reach of the individual. It presents the hardware design and fabrication of what may be the world's lowest cost video digitizer input device for the PC, allowing still video images to be imported into a PC from a low cost television camera for display or manipulation. The book then shows how to display images on PCs and discusses the software required to make a digitizer produce images. Useful example programs illustrate the concepts presented. Because digitized images must be put into a form to be manipulated by other application programs in order to be useful, the book covers

PCX and TIFF graphic file formats, and provides C code for reading and writing each format. Employing a practical rather than rigorous mathematical approach, the book also discusses classical image processing. Each major class of algorithm is illustrated with example C codes and images that show the effect of the algorithm.

Across three volumes, the Handbook of Image Processing and Computer Vision presents a comprehensive review of the full range of topics that comprise the field of computer vision, from the acquisition of signals and formation of images, to learning techniques for scene understanding. The authoritative insights presented within cover all aspects of the sensory subsystem required by an intelligent system to perceive the environment and act autonomously. Topics and features: describes the fundamental processes in the field of artificial vision that enable the formation of digital images from light energy; covers light propagation, color perception, optical systems, and the analog-to-digital conversion of the signal; discusses the information recorded in a digital image, and the image processing algorithms that can improve the visual qualities of the image; reviews boundary extraction algorithms, key linear and geometric transformations, and techniques for image restoration; presents a selection of different image segmentation algorithms, and of widely-used algorithms for the automatic

detection of points of interest; examines important algorithms for object recognition, texture analysis, 3D reconstruction, motion analysis, and camera calibration; provides an introduction to four significant types of neural network, namely RBF, SOM, Hopfield, and deep neural networks. This all-encompassing survey offers a complete reference for all students, researchers, and practitioners involved in developing intelligent machine vision systems. The work is also an invaluable resource for professionals within the IT/software and electronics industries involved in machine vision, imaging, and artificial intelligence. Color perception plays an important role in object recognition and scene understanding both for humans and intelligent vision systems. Recent advances in digital color imaging and computer hardware technology have led to an explosion in the use of color images in a variety of applications including medical imaging, content-based image retrieval, biometrics, watermarking, digital inpainting, remote sensing, visual quality inspection, among many others. As a result, automated processing and analysis of color images has become an active area of research, to which the large number of publications of the past two decades bears witness. The multivariate nature of color image data presents new challenges for researchers and practitioners as the numerous methods developed for single channel images are often not directly applicable to

multichannel ones. The goal of this volume is to summarize the state-of-the-art in the early stages of the color image processing pipeline.

This book describes image processing research based on the morphology of the objects in an image and a VLSI design of a Cellular Logic Processing Element for a real-time processor pipeline. The field of image processing has spawned a number of special parallel computer architectures: the Square (SIMD), Processor Array, the Pyramid, the Linear Processor Array (or scan line array) and the Processor Pipeline. This book features a classification of low-level image processing operations, reviews some intermediate level algorithms, and gives a short introduction into computer architecture used for image and digital signal processing. Morphology-based processing images is introduced by treating cellular logic operations such as skeletonization as hit-or-miss transformations. This approach can be extended to images of higher dimensions than two and a method is described to construct hit-or-miss masks for the skeletonization of these images. In the second part of the book a study is performed on the speed bottlenecks that can be found in the main architectural groups followed by the description of a method for the structured design of integrated, digital hardware. The VLSI design of a CMOS Processing Element for the real-time processing of binary images and the board level design of a scalable processor pipeline for a

real-time low-level processing of grey value images is described in detail. Finally, a computer architecture for low and intermediate processing of two and three dimensional images if proposed.

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Image Processing and Acquisition using Python provides readers with a sound

foundation in both image acquisition and image processing—one of the first books to integrate these topics together. By improving readers' knowledge of image acquisition techniques and corresponding image processing, the book will help them perform experiments more effectively and cost efficiently as well as analyze and measure more accurately. Long recognized as one of the easiest languages for non-programmers to learn, Python is used in a variety of practical examples. A refresher for more experienced readers, the first part of the book presents an introduction to Python, Python modules, reading and writing images using Python, and an introduction to images. The second part discusses the basics of image processing, including pre/post processing using filters, segmentation, morphological operations, and measurements. The last part describes image acquisition using various modalities, such as x-ray, CT, MRI, light microscopy, and electron microscopy. These modalities encompass most of the common image acquisition methods currently used by researchers in academia and industry.

This three-book set constitutes the refereed proceedings of the Second International Conference on Recent Trends in Image Processing and Pattern Recognition (RTIP2R) 2018, held in Solapur, India, in December 2018. The 173 revised full papers presented were carefully reviewed and selected from 374 submissions. The papers are organized in topical sections in

the tree volumes. Part I: computer vision and pattern recognition; machine learning and applications; and image processing. Part II: healthcare and medical imaging; biometrics and applications. Part III: document image analysis; image analysis in agriculture; and data mining, information retrieval and applications.

For both students and engineers in R&D, this book explains machine vision in a concise, hands-on way, using the Vision Development Module of the LabView software by National Instruments. Following a short introduction to the basics of machine vision and the technical procedures of image acquisition, the book goes on to guide readers in the use of the various software functions of LabView's machine vision module. It covers typical machine vision tasks, including particle analysis, edge detection, pattern and shape matching, dimension measurements as well as optical character recognition, enabling readers to quickly and efficiently use these functions for their own machine vision applications. A discussion of the concepts involved in programming the Vision Development Module rounds off the book, while example problems and exercises are included for training purposes as well as to further explain the concept of machine vision. With its step-by-step guide and clear structure, this is an essential reference for beginners and experienced researchers alike.

This book provides a combination of the operational details of imaging hardware and analytical theories of low-level image processing functions. By a blend of optics, stage lighting, and framegrabber descriptions, and detailed theories of CCD and CMOS image sensors, image formation, and camera calibration, the image acquisition part of the book provides a comprehensive reference text for image acquisition. The pre-processing part brings together a wide range of enhancement and filtering kernels and imaging functions through well-structured

analytical bases. With unified coverage of image acquisition modules and pre-processing functions, this book bridges the gaps between hardware and software on one hand and theory and applications on the other. With its detailed coverage of imaging hardware and derivations of pre-processing kernels, it is a useful design reference for students, researchers, application and product engineers, and systems integrators.

This book, written by leading experts from many countries, provides a comprehensive and up-to-date description of how to use 2D and 3D processing tools in clinical radiology. The opening section covers a wide range of technical aspects. In the main section, the principal clinical applications are described and discussed in depth. A third section focuses on a variety of special topics. This book will be invaluable to radiologists of any subspecialty.

Across three volumes, the Handbook of Image Processing and Computer Vision presents a comprehensive review of the full range of topics that comprise the field of computer vision, from the acquisition of signals and formation of images, to learning techniques for scene understanding. The authoritative insights presented within cover all aspects of the sensory subsystem required by an intelligent system to perceive the environment and act autonomously. Volume 2 (From Image to Pattern) examines image transforms, image restoration, and image segmentation. Topics and features: • Describes the fundamental processes in the field of artificial vision that enable the formation of digital images from light energy • Covers light propagation, color perception, optical systems, and the analog-to-digital conversion of the signal • Discusses the information recorded in a digital image, and the image processing algorithms that can improve the visual qualities of the image • Reviews boundary extraction algorithms, key linear and geometric transformations, and techniques for image

restoration • Presents a selection of different image segmentation algorithms, and of widely-used algorithms for the automatic detection of points of interest • Examines important algorithms for object recognition, texture analysis, 3D reconstruction, motion analysis, and camera calibration • Provides an introduction to four significant types of neural network, namely RBF, SOM, Hopfield, and deep neural networks This all-encompassing survey offers a complete reference for all students, researchers, and practitioners involved in developing intelligent machine vision systems. The work is also an invaluable resource for professionals within the IT/software and electronics industries involved in machine vision, imaging, and artificial intelligence. Dr. Cosimo Distante is a Research Scientist in Computer Vision and Pattern Recognition in the Institute of Applied Sciences and Intelligent Systems (ISAI) at the Italian National Research Council (CNR). Dr. Arcangelo Distante is a researcher and the former Director of the Institute of Intelligent Systems for Automation (ISSIA) at the CNR. His research interests are in the fields of Computer Vision, Pattern Recognition, Machine Learning, and Neural Computation.

The Handbook of Image and Video Processing contains a comprehensive and highly accessible presentation of all essential mathematics, techniques, and algorithms for every type of image and video processing used by scientists and engineers. The timely volume will provide both the novice and the seasoned practitioner with the necessary information and skills to be able to develop algorithms and applications for multimedia, digital imaging, digital video, telecommunications, and World Wide Web industries. Handbook of Image and Video Processing will also serve as a textbook for courses such as digital image processing, digital image analysis, digital video, video communications, multimedia, and biomedical image

processing in the departments of electrical and computer engineering and computer science. * No other resource contains the same breadth of up-to-date coverage * Contains over 100 example algorithm illustrations * Contains a series of extremely accessible tutorial chapters * Indispensible for researchers in telecommunications, internet applications, multimedia, and nearly every branch of science

The book consists of 21 chapters which present interesting applications implemented using the LabVIEW environment, belonging to several distinct fields such as engineering, fault diagnosis, medicine, remote access laboratory, internet communications, chemistry, physics, etc. The virtual instruments designed and implemented in LabVIEW provide the advantages of being more intuitive, of reducing the implementation time and of being portable. The audience for this book includes PhD students, researchers, engineers and professionals who are interested in finding out new tools developed using LabVIEW. Some chapters present interesting ideas and very detailed solutions which offer the immediate possibility of making fast innovations and of generating better products for the market. The effort made by all the scientists who contributed to editing this book was significant and as a result new and viable applications were presented.

The three volume set LNAI 5177, LNAI 5178, and LNAI 5179, constitutes the refereed proceedings of the 12th International Conference on Knowledge-Based Intelligent Information and Engineering Systems, KES 2008, held in Zagreb, Croatia, in September 2008. The 316 revised papers presented were carefully reviewed and selected. The papers present a wealth of original research results from the field of intelligent information processing in the broadest sense; topics covered in the third volume are intelligent data processing in process systems and plants; neural information processing for data mining; soft computing approach to

management engineering; advanced groupware; agent and multi-agent systems: technologies and applications; engineered applications of semantic Web; evolvable hardware and adaptive systems; evolvable hardware applications in the area of electronic circuits design; hyperspectral imagery for remote sensing; immunity-based systems; innovations in intelligent multimedia systems and virtual reality; intelligent environment support for collaborative learning; intelligent systems in medicine and healthcare; knowledge interaction for creative learning; novel foundation and applications of intelligent systems; skill acquisition and ubiquitous human computer interaction; smart sustainability; unsupervised clustering for exploratory data anlysis; and use of AI techniques to build enterprise systems.

This long-established and well-received monograph offers an integral view of image processing - from image acquisition to the extraction of the data of interest – written by a physical scientists for other scientists. Supplements discussion of the general concepts is supplemented with examples from applications on PC-based image processing systems and ready-to-use implementations of important algorithms. Completely revised and extended, the most notable extensions being a detailed discussion on random variables and fields, 3-D imaging techniques and a unified approach to regularized parameter estimation. Complete text of the book is now available on the accompanying CD-ROM. It is hyperlinked so that it can be used in a very flexible way. CD-ROM contains a full set of exercises to all topics covered by this book and a runtime version of the image processing software heurisko. A large collection of images, image sequences, and volumetric images is available for practice

exercises

This revised and expanded new edition of an internationally successful classic presents an accessible introduction to the key methods in digital image processing for both practitioners and teachers. Emphasis is placed on practical application, presenting precise algorithmic descriptions in an unusually high level of detail, while highlighting direct connections between the mathematical foundations and concrete implementation. The text is supported by practical examples and carefully constructed chapter-ending exercises drawn from the authors' years of teaching experience, including easily adaptable Java code and completely worked out examples. Source code, test images and additional instructor materials are also provided at an associated website. Digital Image Processing is the definitive textbook for students, researchers, and professionals in search of critical analysis and modern implementations of the most important algorithms in the field, and is also eminently suitable for self-study. Modeling Nanoscale Imaging in Electron Microscopy presents the recent advances that have been made using mathematical methods to resolve problems in microscopy. With improvements in hardware-based aberration software significantly expanding the nanoscale imaging capabilities of scanning transmission electron microscopes (STEM), these mathematical models can replace some labor intensive procedures used to operate and maintain STEMs. This book, the first in its field since 1998, will also cover such relevant concepts as superresolution techniques, special denoising methods,

application of mathematical/statistical learning theory, and compressed sensing. UP-TO-DATE, TECHNICALLY ACCURATE COVERAGE OF ESSENTIAL TOPICS IN IMAGE AND VIDEO PROCESSING This is the first book to combine image and video processing with a practical MATLAB®-oriented approach in order to demonstrate the most important image and video techniques and algorithms. Utilizing minimal math, the contents are presented in a clear, objective manner, emphasizing and encouraging experimentation. The book has been organized into two parts. Part I: Image Processing begins with an overview of the field, then introduces the fundamental concepts, notation, and terminology associated with image representation and basic image processing operations. Next, it discusses MATLAB® and its Image Processing Toolbox with the start of a series of chapters with hands-on activities and step-by-step tutorials. These chapters cover image acquisition and digitization; arithmetic, logic, and geometric operations; point-based, histogram-based, and neighborhood-based image enhancement techniques; the Fourier Transform and relevant frequency-domain image filtering techniques; image restoration; mathematical morphology; edge detection techniques; image segmentation; image compression and coding; and feature extraction and representation. Part II: Video Processing presents the main concepts and terminology associated with analog video signals and systems, as well as digital video formats and standards. It then describes the technically involved problem of standards conversion, discusses motion estimation and compensation techniques,

shows how video sequences can be filtered, and concludes with an example of a solution to object detection and tracking in video sequences using MATLAB®. Extra features of this book include: More than 30 MATLAB® tutorials, which consist of step-by-step guides toexploring image and video processing techniques using MATLAB® Chapters supported by figures, examples, illustrative problems, and exercises Useful websites and an extensive list of bibliographical references This accessible text is ideal for upper-level undergraduate and graduate students in digital image and video processing courses, as well as for engineers, researchers, software developers, practitioners, and anyone who wishes to learn about these increasingly popular topics on their own.

Ultrasound has been widely used in medical diagnostic and therapeutic. This is due to the safety, easiness and cost of this modality application. The existing ultrasound machine is able to visualize the human tissue as acoustic function in 4-dimension. This enables the fetus movement analysis during third trimester pregnancy. However, the dependency of operator causes difficulties to obtain the standard diagnostic image. Manual ultrasound marker measurements are easily prone to human error. The in-homogeneity of human tissue causes the noise of ultrasound image. In cases of low end ultrasound machine application, the images qualities are getting worse due to speckle noise. This book, therefore, provides the basic physics of ultrasound medical imaging. Image processing techniques covered from data acquisition, pre-processing,

speckle noise reduction and segmentation are introduced. Several clinical applications of ultrasound image processing are described using Matlab programming implementation. This should be especially useful for students, lecturers or professional researchers in biomedical and image processing fields.

This edition presents the most prominent topics and applications of digital image processing, analysis, and computer graphics in the field of cultural heritage preservation. The text assumes prior knowledge of digital image processing and computer graphics fundamentals. Each chapter contains a table of contents, illustrations, and figures that elucidate the presented concepts in detail, as well as a chapter summary and a bibliography for further reading. Well-known experts cover a wide range of topics and related applications, including spectral imaging, automated restoration, computational reconstruction, digital reproduction, and 3D models.

In modern medicine, imaging is the most effective tool for diagnostics, treatment planning and therapy. Almost all modalities have went to directly digital acquisition techniques and processing of this image data have become an important option for health care in future. This book is written by a team of internationally recognized experts from all over the world. It provides a brief but complete overview on medical image processing and analysis highlighting recent advances that have been made in academics. Color figures are used extensively to illustrate the methods and help the reader to understand the complex topics.

This book presents today's most powerful signal processing techniques together with methods for assessing imaging system performance when each of these techniques is applied. This multi-use book helps you make the most of sensor hardware through software enhancement, and evaluate system and algorithm performance. You also learn how to make the best hardware/software decisions in developing the next-generation of image acquisition and analysis systems.

Deep learning and image processing are two areas of great interest to academics and industry professionals alike. The areas of application of these two disciplines range widely, encompassing fields such as medicine, robotics, and security and surveillance. The aim of this book, 'Deep Learning for Image Processing Applications', is to offer concepts from these two areas in the same platform, and the book brings together the shared ideas of professionals from academia and research about problems and solutions relating to the multifaceted aspects of the two disciplines. The first chapter provides an introduction to deep learning, and serves as the basis for much of what follows in the subsequent chapters, which cover subjects including: the application of deep neural networks for image classification; hand gesture recognition in robotics; deep learning techniques for image retrieval; disease detection using deep learning techniques; and the comparative analysis of deep data and big data. The book will be of interest to all those whose work involves the use of deep learning and image processing techniques.

This book constitutes the refereed proceedings of the 6th International Conference on Image Analysis and Recognition, ICIAR 2009, held in Halifax, Canada, in July 2009. The 93 revised full papers presented were carefully reviewed and selected from 164 submissions. The papers are organized in topical sections on image and video processing and analysis; image segmentation; image and video retrieval and indexing; pattern analysis and recognition; biometrics face recognition; shape analysis; motion analysis and tracking; 3D image analysis; biomedical image analysis; document analysis and applications.

The video digitizer project. Classical image processing. Additional information. The five volume set CCIS 224-228 constitutes the refereed proceedings of the International conference on Applied Informatics and Communication, ICAIC 2011, held in Xi'an, China in August 2011. The 446 revised papers presented were carefully reviewed and selected from numerous submissions. The papers cover a broad range of topics in computer science and interdisciplinary applications including control, hardware and software systems, neural computing, wireless networks, information systems, and image processing.

In diagnostic medicine a large part of information about the patient is drawn from data, which, more or less, are represented in an opti calor pictorial form. There is a very wide range of such data as e.g. the patients appearance, the various kinds of radiological images, or cytological imagery. In conventional diagnostics the data, as it comes from

the acquisition device, is perceived by the physician and is interpreted with the help of a large amount of "a priori" knowledge to give a diagnostic finding. During the last 15 years a steadily rising number of attempts have been made to support these processes by the application of com puters. The attempts mainly concentrate on three objectives: 1. Support of the perception process by the production of better or new types of images, e.g. by Computer tomography or Computer angio graphy (image processing) . 2. Automation of the interpretation process, e.g. for bloodcell dif ferentiation (pattern recognition) . 3. Management of the steeply rising amount of medical image data in the hospital (image data bases) . Although the early applications of digital methods aimed at the second . . objective, in the last years much more success has been a achieved in the support of the perception process by methods of image process ing. The reason for this is obvious - in the case of automatic interpre tation the a priori knowledge of the physician has to be formalized.

This book is a printed edition of the Special Issue "Image Processing in Agriculture and Forestry" that was published in J. Imaging

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