M6.4

ITERATIVE IDENTIFICATION AND RESTORATION OF IMAGES

R.L. Lagendijk, A.K. Katsaggelos* and J. Biemond

Delft University of Technology, Dept. of EE, Information Theory Group,
Delft, The Netherlands
* Northwestern University, Dept. of EECS, The Technological Institute,
Evanston IL 60201, USA

ABSTRACT

In order to restore distorted images, the unknown blurs have to be identified from the blurred images themselves. We formulate the blur identification problem as a constrained maximum likelihood problem. The constraints directly incorporate a priori known relations between the blur (and image model) coefficients, such as symmetry properties, into the identification procedure. The resulting nonlinear minimization problem is solved iteratively, yielding a very general identification algorithm. An example of blur identification on synthetic data is given.

I. INTRODUCTION

The first step towards the restoration of degraded images is the identification of the kind of degradation the image has suffered. Modelling a blurred image as the output of a 2-dimensional linear system, the identification problem is the problem of estimating the unknown characterising point-spread function (PSF) of this system. One approach to blur identification is to obtain a model of the blurring system from the physical nature of the problem. Unfortunately, one has hardly ever enough a priori knowledge to determine the PSF in this way. Therefore, the information about the blurring process has to be determined from the blurred image itself.

The earliest work on blur identification concentrated on identifying PSFs that have zeros only on the unit bi-circle [1]. One of the shortcomings of this method is that PSFs which do not satisfy this requirement, such as a properly truncated Gaussian PSF, cannot be identified. In more recent work [2,3] the original image is first modeled as a 2-D autoregressive (AR) process. Then, if the observed blurred image is assumed noiseless, the image and blur model identification problem is specified as a 2-D autoregressive moving-average (ARMA) identification problem, where the AR coefficients are related only to the image model, and the MA coefficients only to the blur model (PSF).

Tekalp et al. [2] derived maximum likelihood estimates for these ARMA parameters, and computed them by first decomposing the PSF into four (causal) quarterplane convolutional factors, each of

which is stable in its direction of recursion, and next identifying each of these factors recursively. This approach assumes that the unknown PSF is real, symmetric (i.e. zero phase) and has a positive Fourier transform. Biemond et al. [3] showed that the 2-D ARMA identification can be done in parallel, where each of the parallel channels requires the identification of a 1-D complex ARMA process. An intermediate high-order AR approximation step is used to compute these ARMA coefficients.

In this paper we formulate the blur identification problem as a constrained maximum likelihood (ML) problem. The linear constraints incorporated in the formulation represent a priori known relations between the blur (or image model) coefficients. The resulting nonlinear minimization problem is solved by employing an iterative gradient based minimization procedure. It is conceptually advantageous to use iterative methods, since they offer the possibility of incorporating a priori knowledge about the original blur and image model into the identification procedure. Furthermore, since they act upon one complete image they are free from the causality restrictions imposed by recursive techniques.

In Section II we describe the mathematical (probabilistic) models for the image and degradation. Next, in Section III, we formulate the identification problem as a ML problem. In this section we also describe the iterative algorithm for minimizing the resulting ML index. Some preliminary experimental results are presented in Section IV. Finally, Section V summarizes relevant conclusions and discusses areas of further research.

II. IMAGE AND DEGRADATION MODELS

Basic Model Development

It is assumed that the original image $f(i,j)$ (of the size $N \times N$ pixels) can be represented by the output of a 2-D AR system

$$f(i,j) = \sum_{k,\ell \in W_A} a(k,\ell)f(i-k,j-\ell) + v(i,j). \quad (1)$$

where $a(k,\ell)$ are the image model coefficients, and W_A the support of the image model, which is not necessarily causal. By lexicographically ordering of the image data [1] we can use the more compact matrix-vector notation

$$f = Af + v. \quad (2)$$

Iterative Identification And Restoration Of Images

Judd E. Hollander

Iterative Identification And Restoration Of Images:

Thank you very much for downloading **Iterative Identification And Restoration Of Images**. As you may know, people have look numerous times for their favorite readings like this Iterative Identification And Restoration Of Images, but end up in harmful downloads.

Rather than enjoying a good book with a cup of tea in the afternoon, instead they juggled with some malicious bugs inside their computer.

Iterative Identification And Restoration Of Images is available in our book collection an online access to it is set as public so you can download it instantly.

Our book servers hosts in multiple countries, allowing you to get the most less latency time to download any of our books like this one.

Merely said, the Iterative Identification And Restoration Of Images is universally compatible with any devices to read

https://kmsbrunchlive.gobrunch.com/data/virtual-library/HomePages/Between%20Stars%20Keys%20To%20Reading.pdf

Table of Contents Iterative Identification And Restoration Of Images

Iterative Identification And Restoration Of Images Introduction

In the digital age, access to information has become easier than ever before. The ability to download Iterative Identification And Restoration Of Images has revolutionized the way we consume written content. Whether you are a student looking for course material, an avid reader searching for your next favorite book, or a professional seeking research papers, the option to download Iterative Identification And Restoration Of Images has opened up a world of possibilities. Downloading Iterative Identification And Restoration Of Images provides numerous advantages over physical copies of books and documents. Firstly, it is incredibly convenient. Gone are the days of carrying around heavy textbooks or bulky folders filled with papers. With the click of a button, you can gain immediate access to valuable resources on any device. This convenience allows for efficient studying, researching, and reading on the go. Moreover, the cost-effective nature of downloading Iterative Identification And Restoration Of Images has democratized knowledge. Traditional books and academic journals can be expensive, making it difficult for individuals with limited financial resources to access information. By offering free PDF downloads, publishers and authors are enabling a wider audience to benefit from their work. This inclusivity promotes equal opportunities for learning and personal growth. There are numerous websites and platforms where individuals can download Iterative Identification And Restoration Of Images. These websites range from academic databases offering research papers and journals to online libraries with an expansive collection of books from various genres. Many authors and publishers also upload their work to specific websites, granting readers access to their content without any charge. These platforms not only provide access to existing literature but also serve as an excellent platform for undiscovered authors to share their work with the world. However, it is essential to be cautious while downloading Iterative Identification And Restoration Of Images. Some websites may offer pirated or illegally obtained copies of copyrighted material. Engaging in such activities not only violates copyright laws but also undermines the efforts of authors, publishers, and researchers. To ensure ethical downloading, it is advisable to utilize reputable websites that prioritize the legal distribution of content. When downloading Iterative

Identification And Restoration Of Images, users should also consider the potential security risks associated with online platforms. Malicious actors may exploit vulnerabilities in unprotected websites to distribute malware or steal personal information. To protect themselves, individuals should ensure their devices have reliable antivirus software installed and validate the legitimacy of the websites they are downloading from. In conclusion, the ability to download Iterative Identification And Restoration Of Images has transformed the way we access information. With the convenience, cost-effectiveness, and accessibility it offers, free PDF downloads have become a popular choice for students, researchers, and book lovers worldwide. However, it is crucial to engage in ethical downloading practices and prioritize personal security when utilizing online platforms. By doing so, individuals can make the most of the vast array of free PDF resources available and embark on a journey of continuous learning and intellectual growth.

FAQs About Iterative Identification And Restoration Of Images Books

What is a Iterative Identification And Restoration Of Images PDF? A PDF (Portable Document Format) is a file format developed by Adobe that preserves the layout and formatting of a document, regardless of the software, hardware, or operating system used to view or print it. **How do I create a Iterative Identification And Restoration Of Images PDF?** There are several ways to create a PDF: Use software like Adobe Acrobat, Microsoft Word, or Google Docs, which often have built-in PDF creation tools. Print to PDF: Many applications and operating systems have a "Print to PDF" option that allows you to save a document as a PDF file instead of printing it on paper. Online converters: There are various online tools that can convert different file types to PDF. **How do I edit a Iterative Identification And Restoration Of Images PDF?** Editing a PDF can be done with software like Adobe Acrobat, which allows direct editing of text, images, and other elements within the PDF. Some free tools, like PDFescape or Smallpdf, also offer basic editing capabilities. **How do I convert a Iterative Identification And Restoration Of Images PDF to another file format?** There are multiple ways to convert a PDF to another format: Use online converters like Smallpdf, Zamzar, or Adobe Acrobats export feature to convert PDFs to formats like Word, Excel, JPEG, etc. Software like Adobe Acrobat, Microsoft Word, or other PDF editors may have options to export or save PDFs in different formats. **How do I password-protect a Iterative Identification And Restoration Of Images PDF?** Most PDF editing software allows you to add password protection. In Adobe Acrobat, for instance, you can go to "File" -> "Properties" -> "Security" to set a password to restrict access or editing capabilities. Are there any free alternatives to Adobe Acrobat for working with PDFs? Yes, there are many free alternatives for working with PDFs, such as: LibreOffice: Offers PDF editing features. PDFsam: Allows splitting, merging, and editing PDFs. Foxit Reader: Provides basic PDF viewing and editing capabilities. How do I compress a PDF file? You can use online tools like Smallpdf, ILovePDF, or

desktop software like Adobe Acrobat to compress PDF files without significant quality loss. Compression reduces the file size, making it easier to share and download. Can I fill out forms in a PDF file? Yes, most PDF viewers/editors like Adobe Acrobat, Preview (on Mac), or various online tools allow you to fill out forms in PDF files by selecting text fields and entering information. Are there any restrictions when working with PDFs? Some PDFs might have restrictions set by their creator, such as password protection, editing restrictions, or print restrictions. Breaking these restrictions might require specific software or tools, which may or may not be legal depending on the circumstances and local laws.

Find Iterative Identification And Restoration Of Images :

between stars keys to reading

best stories of hg wells

better homes and gardens great patchwork stars and stripes

best-case scenario handbook a parody

betting on ideas wars invention inflation

best of soul guitar a step-by-step breakdown of guitar styles and techniques

best of personal excellence iv the magazine of life enrichment

best short hikes in northwest oregon

best of martha stewart living what to have for dinner

between science and values

between actor & critic

best water gardens

better homes and husbands

best of zane grey outdoorsman hunting and fishing tales

best practices in interactive marketing a planning guide

Iterative Identification And Restoration Of Images :

Wedding Planning Proposal Template Download PandaDoc's free wedding planning proposal template to create enticing, branded proposals that showcase your wedding services and packages. Free Wedding Planner Proposal Template That Wins Clients This free wedding planner proposal template is written for anyone that offers wedding planning services. Use it to save time writing better proposals. Wedding Planner Services Sample Proposal - 5 Steps Create your own custom version of

this Wedding Planner Services Sample Proposal in 5 steps using our proposal template and software products. Wedding Planner Proposal Template Our wedding planner proposal template will allow you to present a visually stunning showcase of past events. Detail your services with a template that offers ... How to Write An Event Planning Proposal Creating an event planning proposal that wins over clients is not always easy, but it's possible. Here are 5 tips will help you win any client. Wedding Planning Proposal Template Aug 5, 2020 - Wedding planning proposal template, A company proposal is a initiative obtained on behalf of a marketer to market the business [...] Free Wedding Planning Proposal Templates - Revv You plan weddings, let us plan your proposal. Let this wedding planner template take over and vouch for your best first impression on your potential clients. Wedding Planner Contract (Free Sample) This wedding photography contract can be used between photographers and a wedding couple. Get our free wedding photography contract template. Event Planning Proposal Template The document is easy to use and customizable on CANVA, perfect for wedding planners looking for a way to showcase their past events and the value they provide ... Free Arkansas Quit Claim Deed Form - PDF | Word An Arkansas quitclaim deed is a form that is used to transfer property from a seller to a purchaser without any warranty on the title. This type of deed only ... Quitclaim deeds This deed must be signed, notarized, and recorded in the county where the property is located. Some counties have more than one recording office, so you need to ... Arkansas Quitclaim Deed Form May 9, 2023 — Arkansas quitclaim deed form to transfer Arkansas real estate. Attorney-designed and state-specific. Get a customized deed online. Free Arkansas Quit Claim Deed Form | PDF | Word Jul 1, 2022 — An Arkansas quit claim deed allows a grantee to receive a grantor's interest in a property quickly, albeit without any warranty of title. Free Arkansas Quitclaim Deed Form | PDF & Word Aug 8, 2023 — Use our Arkansas quitclaim deed to release ownership rights over any real property. Download a free template here. What to Know about Arkansas Property Deeds All a Quitclaim Deed does is transfer the exact same rights the owner has at that specific time. If there are outstanding claims against the property, the buyer ... Arkansas Quitclaim Deed Forms Quitclaim Deed for Real Estate Located in Arkansas ... A validly executed Arkansas quitclaim deed must meet specific statutory obligations. Content: The Arkansas ... Arkansas Deed Forms for Real Estate Transfers May 21, 2023 — An Arkansas quitclaim deed transfers real estate to a new owner with no warranty of title. The current owner quitclaims—or transfers without ... Free Arkansas Quitclaim Deed Form Are you interested in transferring your residential property to a loved one in Arkansas? Download our free Arkansas quitclaim deed form here to get started. Arkansas quit claim deed: Fill out & sign online Edit, sign, and share arkansas quitclaim deed online. No need to install software, just go to DocHub, and sign up instantly and for free. DCC Wiring – A Practical Guide. With DCC all the current for all the trains comes from one source through one wiring. "bus" run. Minimum capacity provided is normally 5 Amps. Wiring needs to ... DCC Wiring – A Practical Guide Updated With DCC all the current for all the trains comes from one source through the "bus" run. Booster capacity is typically 5 Amps. Wiring needs to handle. DCC Wiring - Max Maginness MMR, 2003-2004 DCC Wiring - A

Practical Guide.: © Max Maginness MMR, 2003-2004. Uploaded by ... DCC Wiring – A Practical Guide. © Max Maginness MMR, 2003-2004. April 2003 ... U.S. Government Publishing Office Style Manual This publication was typeset electronically using Helvetica and Minion Pro typefaces. It was printed using vegetable oil-based ink on recycled paper containing ... Basic DCC Wiring for Your Model Railroad This how-to guide covers the basics, with an overview of DCC, track wiring, cab bus wiring, and converting an existing layout to DCC. Written by Mike Polsgrove, ... Basic DCC Wiring for Your Model Railroad This how-to guide covers the basics, with an overview of DCC, track wiring, cab bus wiring, and converting an existing layout to DCC. Written by Mike ...