

Preface

It has now been over 100 years since photographs started to be used as a visual record of events, people, and places. Over the years, this humble beginning burgeoned into a technological revolution in photographic technology—digital imaging. Today, with an increasing volume of images being captured across an ever-expanding range of devices and innovative technologies that enable fast and easy dissemination, digital images are now ubiquitous in modern life.

In parallel to advances in technology, we have socially come to understand events in a far more visual way than ever before. As a result, digital media in general and digital images in particular are now relied upon as the primary source for news, entertainment, and information. They are used as evidence in a court of law, as part of medical records, or as financial documents. This dependence on digital media, however, has also brought with it a whole new set of issues and challenges which were either not as apparent before or were non-existent. Today, more than ever, people realize that they cannot simply accept photographs at face value. There is often more to an image than meets the eye.

Digital image forensics is a young and emerging field that concerns with obtaining quantitative evidence on the origin and veracity of digital images. In practice, digital image forensics can be defined simply as a process that consists of several steps. The first step starts with the finding of image evidence in a suspect device and organization of this extracted evidence for more efficient search. This is followed by analysis of the evidence for source attribution and authentication, and in the last step a forensic expert gives testimony in court regarding investigative findings. The goal of our book is to present a comprehensive overview and understanding of all aspects of digital image forensics by including the perspectives of researchers, forensics experts, and law enforcement personnel and legal professionals. To the best of our knowledge this is the first book to provide a holistic view of digital image forensics.

To address different aspects of digital image forensics, we organized our book into three parts. Part I starts by tackling the question of how digital images are created in a digital camera. This question is answered in two chapters by focusing on the hardware and processing elements of a digital camera. Next, we address the

question of how images are stored by visiting different image formats and studying their characteristics. The last chapter in this part describes techniques for extracting and recovering image evidence from storage volumes.

Part II of the book provides a scientifically and scholarly sound treatment of state-of-the-art techniques proposed for forensic analysis of images. This part comprises six chapters that are focused on two main problems, namely, the image source attribution and image authenticity verification problem. The first of the three chapters related to source attribution considers class-level characteristics and the following two chapters examine individual characteristics that include image sensor noise and physical defects in the light path of a camera or scanner. The subsequent chapters in this part expand on specific research questions at the core of image authenticity and integrity verification. These chapters present characteristics of natural images and describe techniques for detecting doctored images and discrimination of synthesized or recaptured images from real images.

In Part III, practical aspects of image forensics are considered. The first chapter of this part explores legal issues by addressing questions regarding the validity of digital images in a courtroom. The second chapter focuses on counter-forensics and presents an attacker's perspective.

The availability of powerful media editing, analysis, and creation software, combined with the increase in computational power of modern computers, makes image modification and generation easy even for novice users. This trend is only expected to yield more automated and accurate procedures, making such capabilities available for everyone. Digital image forensics aims at strengthening the trust we place in digital images by providing the necessary tools and techniques to practitioners and experts in the field. The coverage of this book is intended to provide a greater understanding of the concepts, challenges, and opportunities related to this field of study. It is our sincere hope that this book will serve to enhance the knowledge of students and researchers in the field of engineering, forensic experts and law enforcement personnel, and photo enthusiasts who are interested or involved in the study, research, use, design, and development of techniques related to digital image forensics. Perhaps this publication will inspire its readers to contribute to the current discoveries in this emerging field.

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Digital Image Forensics

There is More to a Picture than Meets the Eye

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