

## Chapter 15

# SUPER-RESOLUTION VIDEO ANALYSIS FOR FORENSIC INVESTIGATIONS

Ashish Gehani and John Reif

**Abstract** Super-resolution algorithms typically improve the resolution of a video frame by mapping and performing signal processing operations on data from frames immediately preceding and immediately following the frame of interest. However, these algorithms ignore forensic considerations. In particular, the high-resolution video evidence they produce could be challenged on the grounds that it incorporates data or artifacts that were not present in the original recording.

This paper presents a super-resolution algorithm that differs from its counterparts in two important respects. First, it is explicitly parameterized, enabling forensic video analysts to tune it to yield higher quality in regions of interest at the cost of degraded quality in other regions. Second, the higher resolution output is only constructed in the final visualization step. This allows the intermediate refinement step to be repeatedly composed without tainting the original data.

**Keywords:** Video recordings, super-resolution analysis, parameterization

## 1. Introduction

Surveillance cameras are ubiquitous – monitoring potential interlopers, vehicular traffic and pedestrians, ATM users, and shoppers at stores. When a crime occurs, the recorded footage is often used to identify the perpetrator, the location of the incident and the sequence of events that transpired. Meanwhile, video cameras are commonly embedded in mobile devices such as cell phones and PDAs, enabling users to opportunistically produce recordings of incidents that may subsequently serve as evidence in legal proceedings.

Obviously, the better the quality of a video recording, the greater its value to an investigation and subsequent legal proceedings. However, for a variety of reasons, including lighting, camera features, distance,

# Chapter 20 Super Resolution Video Analysis For Forensic

**Philip Craiger, Sujeet Shenoi**



## **Chapter 20 Super Resolution Video Analysis For Forensic:**

*Advances in Digital Forensics III* Philip Craiger, Sujeet Sheno, 2007-11-14 In 2006 the Federal Bureau of Investigation FBI processed more than two petabytes of digital evidence in 2007 the volume of digital evidence processed will exceed four petabytes Electronic devices are becoming smaller and more diverse memory capacities are increasing according to Moore's Law distributed networks are growing massively in size and scale As society embraces new technologies and applications with gusto digital information will become even more pervasive Digital investigations already involve searching for the proverbial needle in the haystack In five years possibly sooner investigators will have to find the one needle in unimaginably large stacks of needles How will the FBI approach digital investigations of the future How will state and local law enforcement agents cope Digital forensics the scientific discipline focused on the acquisition preservation examination analysis and presentation of digital evidence will have to provide solutions The digital forensics research community must initiate serious efforts to develop the next generation of algorithms procedures and tools that will be desperately needed This book *Advances in Digital Forensics III* is the third volume in the annual series produced by the IFIP Working Group 11.9 on Digital Forensics an international community of scientists engineers and practitioners dedicated to advancing the state of the art of research and practice in the emerging discipline of digital forensics The book presents original research results and innovative applications in digital forensics

**Handbook of Digital Forensics of Multimedia Data and Devices**  
Anthony T. S. Ho, Shujun Li, 2015-07-24 Digital forensics and multimedia forensics are rapidly growing disciplines whereby electronic information is extracted and interpreted for use in a court of law These two fields are finding increasing importance in law enforcement and the investigation of cybercrime as the ubiquity of personal computing and the internet becomes ever more apparent Digital forensics involves investigating computer systems and digital artefacts in general while multimedia forensics is a sub topic of digital forensics focusing on evidence extracted from both normal computer systems and special multimedia devices such as digital cameras This book focuses on the interface between digital forensics and multimedia forensics bringing two closely related fields of forensic expertise together to identify and understand the current state of the art in digital forensic investigation Both fields are expertly attended to by contributions from researchers and forensic practitioners specializing in diverse topics such as forensic authentication forensic triage forensic photogrammetry biometric forensics multimedia device identification and image forgery detection among many others Key features Brings digital and multimedia forensics together with contributions from academia law enforcement and the digital forensics industry for extensive coverage of all the major aspects of digital forensics of multimedia data and devices Provides comprehensive and authoritative coverage of digital forensics of multimedia data and devices Offers not only explanations of techniques but also real world and simulated case studies to illustrate how digital and multimedia forensics techniques work Includes a companion website hosting continually updated supplementary materials ranging from extended and updated

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### **Table of Contents Chapter 20 Super Resolution Video Analysis For Forensic**

1. Understanding the eBook Chapter 20 Super Resolution Video Analysis For Forensic
  - The Rise of Digital Reading Chapter 20 Super Resolution Video Analysis For Forensic
  - Advantages of eBooks Over Traditional Books
2. Identifying Chapter 20 Super Resolution Video Analysis For Forensic
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Chapter 20 Super Resolution Video Analysis For Forensic
  - User-Friendly Interface
4. Exploring eBook Recommendations from Chapter 20 Super Resolution Video Analysis For Forensic
  - Personalized Recommendations
  - Chapter 20 Super Resolution Video Analysis For Forensic User Reviews and Ratings

- Chapter 20 Super Resolution Video Analysis For Forensic and Bestseller Lists
- 5. Accessing Chapter 20 Super Resolution Video Analysis For Forensic Free and Paid eBooks
  - Chapter 20 Super Resolution Video Analysis For Forensic Public Domain eBooks
  - Chapter 20 Super Resolution Video Analysis For Forensic eBook Subscription Services
  - Chapter 20 Super Resolution Video Analysis For Forensic Budget-Friendly Options
- 6. Navigating Chapter 20 Super Resolution Video Analysis For Forensic eBook Formats
  - ePub, PDF, MOBI, and More
  - Chapter 20 Super Resolution Video Analysis For Forensic Compatibility with Devices
  - Chapter 20 Super Resolution Video Analysis For Forensic Enhanced eBook Features
- 7. Enhancing Your Reading Experience
  - Adjustable Fonts and Text Sizes of Chapter 20 Super Resolution Video Analysis For Forensic
  - Highlighting and Note-Taking Chapter 20 Super Resolution Video Analysis For Forensic
  - Interactive Elements Chapter 20 Super Resolution Video Analysis For Forensic
- 8. Staying Engaged with Chapter 20 Super Resolution Video Analysis For Forensic
  - Joining Online Reading Communities
  - Participating in Virtual Book Clubs
  - Following Authors and Publishers Chapter 20 Super Resolution Video Analysis For Forensic
- 9. Balancing eBooks and Physical Books Chapter 20 Super Resolution Video Analysis For Forensic
  - Benefits of a Digital Library
  - Creating a Diverse Reading Collection Chapter 20 Super Resolution Video Analysis For Forensic
- 10. Overcoming Reading Challenges
  - Dealing with Digital Eye Strain
  - Minimizing Distractions
  - Managing Screen Time
- 11. Cultivating a Reading Routine Chapter 20 Super Resolution Video Analysis For Forensic
  - Setting Reading Goals Chapter 20 Super Resolution Video Analysis For Forensic
  - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Chapter 20 Super Resolution Video Analysis For Forensic
  - Fact-Checking eBook Content of Chapter 20 Super Resolution Video Analysis For Forensic
  - Distinguishing Credible Sources

13. Promoting Lifelong Learning
  - Utilizing eBooks for Skill Development
  - Exploring Educational eBooks
14. Embracing eBook Trends
  - Integration of Multimedia Elements
  - Interactive and Gamified eBooks

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