

## 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

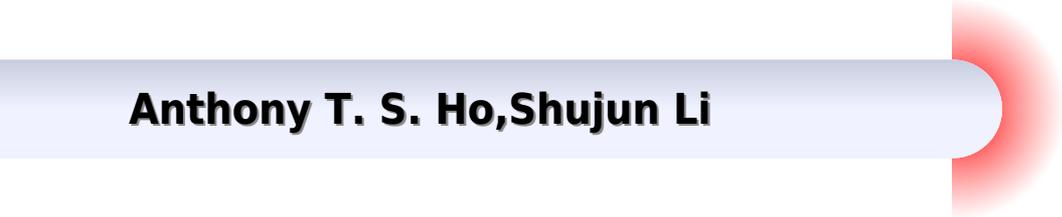
## 1. Introduction

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,

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**Anthony T. S. Ho, Shujun Li**



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**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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