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Information Technology for Intellectual Property Protection

Interdisciplinary Advancements



Hideyasu Sasaki

Information Technology for Intellectual Property Protection:

Interdisciplinary Advancements

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Preface

Information technology for intellectual property protection is a hot issue on the globe in the twenty first century because the recent expansion of network connectivity to the Internet known as ubiquitous allows people to enjoy a number of contents and programs stored in the digital forms which are fragile to unauthorized electric duplication or copyright and patent infringement. Institutional protection against digital infringement of multimedia intellectual property has been practically supported by technical solutions which digitally maneuver multimedia contents and programs in the Internet. The advent of new solutions in the area of information technology will allow easy access to the tools for multimedia intellectual property infringement as a negative side effect of innovation.

Facing the digital infringement of intellectual property of contents and programs as operating software of those contents, those in the fields of multimedia information engineering and its institutional operations have been aware of a need of a complete reference of past, current, and future trends of multimedia intellectual property protection from technology to institutions. This book offers a first reference on information technology for intellectual property protection with multidisciplinary knowledge and analyses which are given by leading researchers and practitioners with technical backgrounds in information engineering and institutional experiences in intellectual property practice.

INTRODUCTION

The principal concern of this book is to provide those in the information technology and its institutional practice with a series of concise and thorough references on a variety of issues of intellectual property protection and its proper solutions from the technical aspects. We discuss both technical and institutional solutions to intellectual property protection.

We thoroughly discuss institutional and technical issues and provide their solutions on information technology for intellectual property protection. The goal of

this book is to design a complete reference in the area of information technology for intellectual property protection. Already published books just discuss institutional analyses without interdisciplinary insights by technical experts. Meanwhile, technical references only talk about engineering solutions without the social impact to institutional protection. This book should fill in that gap to fulfill a great mission under which people in the field of information technology for intellectual property protection can discuss all the related issues and their solutions from both institutional and technical aspects.

CHALLENGES

The book brings in a first guidance or introductory reference to graduate students and students in professional schools, researchers, and practitioners in the areas of policy, engineering, and education, and provides them with mandatory knowledge bases on information technology for intellectual property protection. This kind of complete reference has not been available in the previous research publication. Its scholarly value is found in the brand new aspect of engineering solutions to intellectual property protection.

The content of the book is appealing to academia, in which those concerned about intellectual property management are eager to acquire sound techniques for intellectual property protection and fundamental knowledge on intellectual property rights in the frontiers of IT outbursts. Meanwhile, the book works as a technical milestone for research trends of intellectual property protection engineering in the target of the next ten years. Both practitioners with technical agendas and IT engineers of institutional agendas should appreciate this kind of interdisciplinary title.

ORGANIZATION

The book is organized into eleven chapters:

Chapter 1 discusses a robust watermarking technique which is based on distributed multi-resolution transforms (DMT) and singular value decomposition to improve the protection of images.

Chapter 2 discusses masking models and watermarking with two strategies for using a masking model in its application to a classic watermarking technique.

Chapter 3 discusses content encryption for secure communication and provides an overview of encryption technology from background, brief history, and requirement to research progress with general and special encryption algorithms.

Chapter 4 discusses damage-less watermark extraction for information hiding using non-linear feature extraction scheme trained on frequency domain.

Chapter 5 discusses user authentication in IP networks and introduces basic concepts of authentication and challenge-response frameworks.

Chapter 6 discusses query rewriting algorithms for access control to avoid resource-leakage in Semantic Web systems.

Chapter 7 discusses ticketing services using an auction system design for seat reservations at theaters.

Chapter 8 discusses legal protection of Web pages from the database perspective and refers to the World Intellectual Property Organization Copyright Treatments and European Directive 96/92/CE with its future trends.

Chapter 9 discusses a concept of knowledge commons and open content licenses from the perspective of communities.

Chapter 10 discusses a peer-to-peer architecture based on autonomous and self-emerging communities for managing collective knowledge.

Chapter 11 discusses a community creation using bookmarks as resources available in the Internet to make linkages between people of common interests.

GUIDELINE

The main target of prospective academic audience is graduate students who study computer science, information engineering, system engineering, information studies, management of information technology, and library science. Another target is students who are working towards professional degrees in business schools, management schools, MOT programs, public policy schools, law schools, or their equivalents. The other target is not a small number of practitioners including lawyers who counsel to IT companies as in-house counsels or at firms, chief information officers (CIOs), chief technology officers (CTOs), and chief risk management officers (CROs) in enterprises and the consultants in those related fields. Not the last but an important part of prospective audience is found in a large number of intellectual property related staff or administrators in universities and librarians.

The book is designed to offer a reference in the communities on information technology for intellectual property protection. The book has eleven chapters, which should be well allocated as assignments in class at Junior or Senior engineering of the undergraduate lectures, and master-level graduate schools.

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The editor would like to thank all the authors who have submitted chapter proposals, and all authors and reviewers for their excellent contributions and insights, without which this book should not have been possible. Special thanks go to IGI Global for its great editorial assistance.

Hideyasu Sasaki
Chinese University of Hong Kong, Hong Kong
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In this chapter, a robust watermarking technique based on distributive multiresolution transforms (DMT) and singular value decomposition is presented to improve the protection of the images. First, the watermark image is mapped to another form to get reference watermark which is secret and only known to the owner/creator. In order to map watermark image into reference form, chaotic maps are used. The core idea of the proposed technique is to decompose host image via DMT followed by reference watermark embedding in DMT coefficients by modifying the singular values. After embedding, inverse transform is performed to get watermarked image. Two new different distributive multiresolution transforms, namely distributive multiresolution Fourier and distributive multiresolution cosine transform, are explored and used. The feasibility of the proposed method and its robustness against different kind of attacks are verified by computer simulations, and superiority is carried out by the comparisons with the existing methods.

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Mirko Luca Lobina, University of Cagliari, Italy

Daniele D. Giusto, University of Cagliari, Italy

Davide Mula, European University of Rome, Italy

Many audio watermarking techniques, presented in the last years, make use of masking and psychological models derived from signal processing. Such a basic idea is winning because it guarantees a high level of robustness and bandwidth of the watermark as well as fidelity of the watermarked signal. This work first describes the relationship between Digital Right Management, Intellectual Property, and use of watermarking techniques. Then, the crossing use of watermarking and Masking Models is detailed, providing schemes, examples, and references. Finally, the authors present two strategies that make use of a Masking Model, applied to a classic watermarking technique. The joint use of classic frameworks and Masking Models seems to be one of the trends for the future of research in watermarking. Several tests on the proposed strategies with the state of the art are also offered to give an idea of how to assess the effectiveness of a watermarking technique.

Chapter 3

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Shiguo Lian, France Telecom (Orange Labs) Beijing, China

The principal concern of this chapter is to provide those in the secure multimedia communication or content protection community with an overview of multimedia content encryption technology. Multimedia (image, audio or video) content encryption technologies are reviewed, from the background, brief history, and performance requirement, to research progress. Additionally, the general encryption algorithms are classified, and their performances are analyzed and compared. Furthermore, some special encryption algorithms are introduced. Finally, some open issues and potential research topics are presented, followed by some conclusions. The author hopes that the chapter will not only inform researchers of the progress of multimedia content encryption but also guide the design of practical applications in industry field.

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Kensuke Naoe, Keio University, Japan

Yoshiyasu Takefuji, Keio University, Japan

In this chapter, we propose a new information hiding and extraction scheme for the application in digital watermarking, which does not embed any data to target content, by using non-linear feature extraction scheme trained on frequency domain. This is

done by processing the selected coefficients from the selected feature sub-blocks as an input vector to the trained neural network and observing output signal from the neural network. This output signal is used as watermark signal which distinguishes its image from other images. This model trains an artificial neural network to assign predefined secret code for corresponding input feature vector of an image and use this trained artificial neural network weight and the coordinates of the selected feature sub-blocks as a key to extract the predefined secret code. The proposed method contributes to secure image digital watermarking for content identification without damaging or losing any detailed data of visual images. The features of our proposed method employ an application to authenticate multimedia, similarity comparison, verification of image integrity and copyright protection of multimedia contents.

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Giaime Ginesu, University of Cagliari, Italy

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Daniele D. Giusto, University of Cagliari, Italy

Authentication is the way of identifying an individual. The techniques used to accomplish such practice strongly depend on the involved parties, their interconnection, and the required level of security. In all cases, authentication is used to enforce property protection, and may be specifically intended for the copyright protection of digital contents published on the Internet. This work introduces the basic concepts of authentication explaining their relationship with property protection. The basic functionalities of Challenge-Response frameworks are presented, together with several applications and the future trends.

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Jian Li, Hong Kong Baptist University, China

William K. Cheung, Hong Kong Baptist University, China

Semantic Web technologies allow on-line resources to be semantically annotated to support more effective and intelligent online services. However, ontologies sometimes may contain sensitive information. Providing access to them requires proper control to ensure the data protection requirement. Yet, the protection should not be too restrictive to make the access management inflexible. While there has been recent work on policy-based access control, in this paper, the authors present a policy representation specifically for access control on ontology-based data and explain how issues like policy propagation and policy conflict resolution are addressed. The authors present bucket-based query rewriting algorithms for realizing the access control policies to avoid sensitive resources leakage in the context of the Semantic Web. The authors validate the correctness of the proposed mechanisms by going through some illustrative examples in detail.

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Koji Fukuya, The University of Tokyo, Japan

Kanji Ueda, National Institute of Advanced Industrial Science and Technology, Japan & The University of Tokyo, Japan

This chapter proposes a new auction mechanism with seat reservations in movie theaters using an interdisciplinary approach. In movie theater services, the movie price is generally fixed, not depending on the quality of contents or the theater seat. It implies that such a service mechanism by fixed pricing might not reflect the value of movie contents. In this study, a new mechanism of theater services is proposed introducing the Vickrey–Clarke–Groves (VCG) mechanism and Gale–Shapley (GS) mechanism, which present effectiveness in the field of mechanism design. First derived is the theoretical predictions of equilibrium and how the mechanism works using experiments with human subjects. In addition, agent-based simulation is conducted using agents that make the decisions observed in the experiments. Consequently, the results present the validity of the proposed mechanism, showing an increase in the social surplus.

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Chapter 8

Legal Protection of the Web Page	213
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Davide Mula, European University of Rome, Italy

Mirko Luca Lobina, University of Cagliari, Italy

Nowadays the Web Page is one of the most common media used by people, institutions, and companies to promote themselves, to share knowledge, and to get through to everybody in every part of the world. In spite of that, the web page isn't entitled to a specific legal protection, and because of this, every investment of time and money that stay off-stage aren't protected by an unlawfully used. Seeing that no country in the world has specific legislation on this issue, in this chapter we develop a theory that wants to give legal protection to web pages using laws and treatment that are present in this moment. In particular we maintain that web pages can be considered as a database so to extend database's legal protection to the first one. We start to analyze each component of database's definition and to find them in a web page so that we can compare those juridical goods. After that we analyze present legislation concern database and in particular World Intellectual Property Organization Copyright Treatments and European Directive 96/92/CE, which we consider as the best legislation in this field. In the end, we outline future trends that seem to appreciate and apply our theory.

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In recent years impacts of information and communication technologies, market enclosures, and the opposing struggle to retain community and public goods have had significant impacts on the social interactions of communities. This chapter examines communities in the context of the knowledge commons – a space by which “a particular type of freedom” (Benkler, 2004) can be practised. It also provides an appropriate lexicon to the examination and discourse of communities and the ways they work. As Castells (2003) notes, self-knowledge “is always a construction no matter how much it feels like a discovery” – this construction is enabled when people work or associate themselves with each other. In particular, the chapter is concerned about the structure of open content licenses operating within such domains. The chapter first explores the concept of the knowledge commons to understand the types of intellectual property that are distinctive to communities (public, communal, and private). Thereafter, licenses as a structure are examined as they may apply within such contexts. A significant influence on the discussion is the contemporary media environment that communities operate in today, resulting in the breaking down of boundaries, the blurring of distinctions between an original and a copy, and shifting the nature of production in communities. These debates lead to a case for open content licenses as an appropriate structural mechanism for communities.

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<i>Alfio Ferrara, Università degli Studi di Milano, Italy</i>	
<i>Gaia Varese, Università degli Studi di Milano, Italy</i>	

In this paper, the authors present a reference P2P architecture based on autonomous, self-emerging semantic communities of interest (CoIs) for collective intelligence creation and management. An approach for enabling knowledge organization and management at the level of a single peer is presented in the paper, as well as techniques for supporting a peer to participate to the construction of a shared community vocabulary, according to the terminological preferences automatically extracted from its personal knowledge. Furthermore, an application example in the e-health domain is presented in the framework of the iCoord system for P2P semantic coordination to show the use of a manifesto-based collective intelligence for enforcing effective collaboration in a real case study.

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The emergence of Web 2.0 has brought along the trend of community. It is also the trend that contributes to socialization of the Internet. The essence of Web 2.0 is creation and sharing which give rise to social networking communities such as Blog, Wikipedia and Facebook. Through Wikipedia, Blogs, Facebook and other kinds of social networking websites, interactive relationship and bridge of knowledge sharing have been built up successfully. This paper attempts to propose an effective way to locate people with shared interests. By using Internet resources bookmarked by the users, the similarity of interests between them can be analyzed. Based on this relationship, people could build communities. Also, through community activities, the innovation and exchange of collective intelligence are accomplished.

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Chapter 1

Distributed Multiresolution Transform Based Framework for Watermarking

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ABSTRACT

In this chapter, a robust watermarking technique based on distributive multiresolution transforms (DMT) and singular value decomposition is presented to improve the protection of the images. First, the watermark image is mapped to another form to get reference watermark which is secret and only known to the owner/creator. In order to map watermark image into reference form, chaotic maps are used. The core idea of the proposed technique is to decompose host image via DMT followed by reference watermark embedding in DMT coefficients by modifying the singular values. After embedding, inverse transform is performed to get watermarked image.

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