

# Multimedia Encryption, Transmission and Authentication

Edited by

**Othman Omran Khalifa**, B.Sc., M.Sc., Ph.D.  
International Islamic University Malaysia

**Aisha-Hassan Abdulla**, B.Sc., M.Sc., Ph.D.,  
International Islamic University Malaysia

**Teddy Surya Gunawan**, B.Sc., M.Sc., Ph.D.,  
International Islamic University Malaysia



IIUM PRESS

INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

# Multimedia Encryption, Transmission and Authentication

Edited by

**Othman Omran Khalifa**, B.Sc., M.Sc., Ph.D.  
International Islamic University Malaysia

**Aisha-Hassan Abdulla**, B.Sc., M.Sc., Ph.D.,  
International Islamic University Malaysia

**Teddy Surya Gunawan**, B.Sc., M.Sc., Ph.D.,  
International Islamic University Malaysia



IIUM Press

Published by:  
IIUM Press  
International Islamic University Malaysia

First Edition, 2011  
©IIUM Press, IIUM

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without any prior written permission of the publisher.

Cataloguing-in-Publication Data      Perpustakaan Negara Malaysia

ISBN: 978-967-418-160-4

Member of Majlis Penerbitan Ilmiah Malaysia – MAPIM  
(Malaysian Scholarly Publishing Council)

Printed by :  
**IIUM PRINTING SDN. BHD.**  
No. 1, Jalan Industri Batu Caves 1/3  
Taman Perindustrian Batu Caves  
Batu Caves Centre Point  
68100 Batu Caves  
Selangor Darul Ehsan

## Contents

		Page No.
<b>Part I- Multimedia Encryption and Transmission</b>		
Chapter 1	Image and Video Coding Techniques <i>Sinzobakwira Issa and Othman O. Khalifa</i>	2
Chapter 2	Video Coding: MPEG standards <i>Othman O. Khalifa, Sinzobakwira Issa and Muhammad Umar Siddiqi</i>	7
Chapter 3	H.264/Advance Video Coding Standard <i>Othman O. Khalifa, Sinzobakwira Issa and Aisha-Hassan Abdulla</i>	16
Chapter 4	Development of Scalable Video Compression algorithm <i>Othman O. Khalifa, Sinzobakwira Issa and Mohamed Abomhara</i>	22
Chapter 5	Video Encryption Using Computation between H.264/AVC and AES Encryption Algorithm <i>Mohamed Abomhara Omar Zakaria and Othman O. Khalifa</i>	29
Chapter 6	Selective Video Encryption Algorithm Based on H.264/AVC and AES <i>Mohamed Abomhara Omar Zakaria and Othman O. Khalifa</i>	39
Chapter 7	Scalable Video Coding: A Review <i>Haris Al Qodri Maarif, Teddy Surya Gunawan, Othman O. Khalifa</i>	56
Chapter 8	JSVM Reference Software <i>Haris Al Qodri Maarif, Teddy Surya Gunawan, Othman O. Khalifa</i>	71
Chapter 9	Fast Mode Decision Algorithm <i>Haris Al Qodri Maarif, Teddy Surya Gunawan, Othman O. Khalifa</i>	78
Chapter 10	An Overview of Scalable Video Streaming <i>Mohammed Abumuala, Othman Khalifa and Aisha-Hassan A. Hashim</i>	88
Chapter 11	A Survey on Video Segmentation for Real-Time Applications <i>Haris Al Qodri Maarif, Sara Bilal, Teddy Surya Gunawan, Othman O. Khalifa</i>	100
Chapter 12	H.264/AVC Video Coding Tools and Functions <i>Sinzobakwira Issa, Othman O. Khalifa and Aisha-Hassan Abdulla</i>	107
Chapter 13	Speech Coding Techniques and Algorithms <i>Liban A. Kassim, Othman O. Khalifa, Teddy S. Gunawan</i>	116
<b>Part II- Digital Watermarking</b>		
Chapter 14	Digital Watermarking: An Overview <i>Othman O. Khalifa and Yusnita binti Yusof</i>	135
Chapter 15	Digital Watermarking : Related work <i>Othman O. Khalifa and Yusnita binti Yusof</i>	143
Chapter 16	Digital Watermarking Techniques and Methodologies <i>Othman O. Khalifa and Yusnita binti Yusof</i>	150
Chapter 17	Wavelet Transform for Digital Images Watermarking <i>Othman O. Khalifa, Yusnita Yusof</i>	156
Chapter 18	Wavelet Digital Watermarking System Design and Performance Evaluation <i>Othman O. Khalifa and Yusnita binti Yusof</i>	166
Chapter 19	An Improved Wavelet Digital Watermarking Software Implementation <i>Othman O. Khalifa and Yusnita binti Yusof</i>	175

Chapter 20	Adaptive Digital Watermarking System for Authentication of Intellectual Properties <i>Rashidah F. Olanrewaju, Azizah Abd Manaf and Akram Zeki</i>	182
Chapter 21	An Evaluation of Transform Domain Watermarking and its application to Intellectual Properties of images <i>Rashidah F. Olanrewaju, Othman O Khalifa, Aisha Hassan Hashim, A.A. Aburas and Akram Zeki</i>	192
Chapter 22	Applications of Digital Watermarking: Current and Future Trends <i>Othman O. Khalifa and Yusnita binti Yusof</i>	198
Chapter 23	State-Of-The-Art Digital Watermarking Attacks <i>Othman O. Khalifa and Yusnita binti Yusof</i>	204
Chapter 24	Performance evaluations of Digital Watermarking System <i>Yusnita binti Yusof and Othman O. Khalifa</i>	215
<b>Part-III Multicast Transmission</b>		
Chapter 25	Classifications Of Multicast Routing In Mobile Ad Hoc Networks <i>Mohammad Qabajeh, Aisha-Hassan A. Hashim, Othman O. Khalifa and Liana Qabajeh</i>	221
Chapter 26	Qualitive study on Multicast Routing Protocols In Manets <i>Mohammad Qabajeh, Aisha-Hassan A. Hashim, Othman O. Khalifa and Liana Qabajeh</i>	228
Chapter 27	Issues In Location-Based Multicast Routing In Manets <i>Mohammad Qabajeh, Aisha-Hassan A. Hashim, Othman O. Khalifa and Liana Qabajeh</i>	235
Chapter 28	Multicasting Challenges In Wireless Mesh Networks <i>M. L. Sanni, A. A. Hashim, F. Anwar and J. I. Daoud</i>	241
Chapter 29	Mobility Management In Multicast Environment <i>M. L. Sanni, A. A. Hashim, A. W. Naji and G. S. M. Ahmed</i>	249
Chapter 30	<i>Multicast Security</i> : Issues and Solutions <i>Mohammad Qabajeh, Aisha-Hassan A. Hashim and Othman O. Khalifa</i>	257
Chapter 31	Real-time MPEG-4 transmission over Wireless LAN <i>Abdirisag Mohammed Jama and Othman O. Khalifa</i>	263

## Chapter 3

# H.264/ADVANCE VIDEO CODING STANDARD

*Othman O. Khalifa, Sinzobakwira Issa and and Aisha-Hassan Abdulla*

Department of Electrical and Computer Engineering Department, Faculty of Engineering,  
International Islamic University Malaysia, 50728 Kuala Lumpur, Malaysia

### 3.1. INTRODUCTION

A remarkable development was achieved in the field of video compression in the past few decades. The first MPEG and H.264 generations were engines behind the triumph and marketability of digital video compression. The ITU-T and ISO/IEC are the main actors in developing image and video coding standard. These two bodies have emerged jointly in developing the newer standard H.264/AVC in the world of telecommunication particularly in the area of video compression. With the aim of doubling the compression effectiveness, the ITU-T video coding expert group proposed a new video coding standard which would overshadow the existing one [1]. The joint video team (JVT) was formed consisting of the members of ITU-T VCEG and the ISO/IEC moving picture experts group (MPEG) in 2001 to start the development of the resulting effort based on the expertise of the two factions [2].

At the beginning, the H.264/AVC standard was created for just “entertainment quality” video with a sampling format limited to 4:2:0 with 8 bits of sample accuracy. A modification was done and added to the standard called the Fidelity Range Extensions (FRExt) in July 2004. The FRExt includes the so-called “High Profiles” for the sake of enhancing the performance of compressed video. This leads to professional applicability and the commencement of the high profiles that could support up to 4:4:4 sampling format and bit sampling accuracy.

In recent times, an ‘Advanced 4:4:4 Profile’ has been projected to code 4:4:4 format video. The latest proposal involves coding of chroma components in 4:4:4 and also luma coding tools [4]. However, the work is still being carried out to develop a new feature of scalable video coding that is supported by H.264/AVC. It should be noted that the H.264/AVC was designed to achieve a high compression efficiency, error resilience and flexible coding in order to support a wide applications ranging from transport to the end delivery, through wired or wireless networks.

Among the applications supported by H.264/AVC standard are: