Topics in Coding, Cryptography and Information Security

Editors:

Mohammad Umar Siddiqi
Sigit Puspito Wigati Jarot
Othman Omran Khalifa

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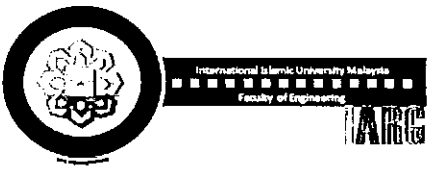

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Contents

Chapter 10

Channel Coding in Mobile WiMAX

Rashid A. Saeed and Othman O. Khalifa

10.1. Introduction

In general, WiMAX (Worldwide Interoperability for Microwave Access) is a metropolitan access technique, which not only provides wireless access, but also expands the coverage of wired networks. This facilitates network access for remote or suburban areas. In 2004, the IEEE 802.16d standard was published for Fixed Wireless Access (FWA) applications. In December 2005 the IEEE ratified the 802.16e amendment, which aimed to support Mobile Wireless Access (MWA) with seamless network coverage [1]. Consequently, as 802.16e is commercialized, WiMAX will become a promising scheme to evolve FWA to MWA. At present there is particular interest in mobile WiMAX, since this offers data transfer rates that exceed those of current 3G [2]. In this chapter we discussed mobile WiMAX channel code: concatenated Reed-Solomon-convolutional code (RS-CC), Block turbo coding (BTC) and Convolutional turbo codes (CTC). Each has four channel coding steps: randomization, forward error correction (FEC) interleaving, and modulation. A pseudorandom noise (PN) sequence generator is used to randomize each FEC data block.

10.2. Overview of (Mobile) WiMAX

In general, WiMAX (Worldwide Interoperability for Microwave Access) is a metropolitan access technique, which not only provides wireless access, but also expands the coverage of wired networks. This facilitates network access for remote or suburban areas. In 2004, the IEEE 802.16d standard was published for Fixed Wireless Access (FWA) applications. In December 2005 the IEEE ratified the 802.16e amendment, which aimed to support Mobile Wireless Access (MWA) with seamless network coverage [1]. Consequently, as 802.16e is commercialized, WiMAX will become a promising scheme to evolve FWA to MWA. At present there is particular interest in mobile WiMAX, since this offers data transfer rates that exceed those of current 3G [2].

The mobile WiMAX air inter-face adopts Scalable Orthogonal Frequency Division Multiple Access (SOFDMA) for improved multi-path performance in non-line-of-sight (NLOS) environments. Radio resource allocation and sharing (also known as channel loading) plays an important roll in optimizing the performance of WiMAX-based OFDMA systems [3]. Radio resources allocation is a major challenge for relay systems. Resource allocation such as power control has long