Topics in Coding, Cryptography and Information Security

Editors:

Mohammad Umar Siddiqi
Sigit Puspito Wigati Jarot
Othman Omran Khalifa

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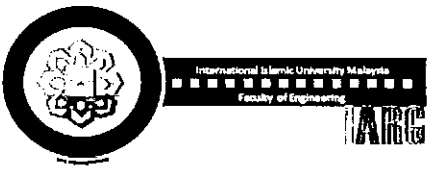

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Chapter 8

Channel Coding Techniques in Mobile Communication Systems

Othman O. Khalifa and Rashid A. Saeed

8.1. Introduction

The aim of any communication schemes is to provide error-free data transmission. In a communication system, information can be transmitted by analog or digital signals. In a wireless communication channel, the signals transmitted by the terminals suffer from a variety of degradations, such as additive white Gaussian noise (AWGN), shadowing, and multi-path fading and can be altered or lost during transmission due to channel noise. In all wireless systems would be impossible without channel coding. Therefore, an Error control is required to detect and possibly correct errors by introducing redundancy to the stream of bits to be sent to the channel. The Channel Encoder will add bits to the message bits to be transmitted systematically. After passing through the channel, the Channel decoder will detect and correct the errors [1][2][3].

8.2. Common Communications Channels

Various communication channels can provide a connection between a transmitter and its destination. Common Communications channels are to receiver with a wire such as coaxial cables, ethernet cables, and twisted-pair wires and optical. Wireline channels are more private and much less prone to interference. Simple wireline channels connect a single transmitter to a single receiver: a point-to-point connection as with the telephone. Listening in on a conversation requires that the wire be tapped and the voltage measured. Some wireline channels operate in broadcast modes: one or more transmitter is connected to several receivers. One simple example of this situation is cable television. Computer networks can be found that operate in point-to-point or in broadcast modes. Wireless channels are much more public, with a transmitter's antenna radiating a signal that can be received by any antenna sufficiently close enough such as mobiles, Wi-Fi Technology, Bluetooth, etc. In contrast to wireline channels where the receiver takes in only the transmitter's signal, the receiver's antenna will react to electromagnetic radiation coming from any source. This feature has two faces: The smiley face says that a receiver can take in transmissions from any source, letting receiver electronics select wanted signals and disregarding others, thereby allowing portable transmission and reception, while the frowny face says that interference and