Chapter 6
Integer Transform-Based Watermarking Scheme for Authentication of Digital Fundus Images in Medical Science:
An Application to Medical Image Authentication

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ABSTRACT

This chapter presents an integer transform-based watermarking scheme for digital fundus image authentication. It is presented under multimedia applications in medicine. The chapter introduces image authentication by watermarking and digital fundus image. The key requirements in developing watermarking scheme for fundus images and its challenges are identified and highlighted. Authors describe a proposed watermarking scheme on integer transform. The experimental results emphasize the proposed scheme's ability in addressing key requirements and its attainment. The detailed results are summarized.

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INTRODUCTION

The advent of modern computing techniques and the explosion of the World Wide Web (WWW) are integrated together for providing instant information access to a large percentage of homes and businesses. The development of such integration has stimulated the use of information in the form of text, pictures, graphics, and integrated multimedia applications. Such information is acquired by converting a continuous signal into digital format and it can be viewed by using display devices such as computer monitors and projectors. This information is widely exchanged in digital visual format for its transmission, reception, storage, processing and display. The recent developments on the Internet with the inexpensive digital recording and storage devices have created an environment in which digital information can easily be accessed, replicated and distributed without any loss in quality. This has become a concern for information security. Thus, such information needs to be secured by an efficient method while it is being exchanged (Bovik, 2000) (Cole, 2003). Digital Image Processing (DIP) is a new technological advancement in the areas of digital computation and telecommunication. An image can be defined as two-dimensional function $f(x, y)$, where x and y are spatial coordinates and f is the amplitude at the spatial coordinate pair(x, y), known as grey value or intensity value at that location (x, y). If the spatial coordinates (x, y) and amplitude f are finite, discrete quantities, then the image is called a digital image. The term DIP refers to the processing of digital images by means of digital computers (Gonzalez & Woods, 2002). The DIP incorporates prior knowledge, identification of objects, interpretation of objects, description of objects, pattern classification and pattern recognition.

The applications of DIP acquire a broad spectrum of radiation as shown in figure 1. The ranges of image types can be derived from every type of radiation. The digital image acquisition methods are developed and improved by means of these radiations. For example, the recent developments in medical images come from new sensors that record image data from previously little-used sources of radiation, such as Positron Emission Tomography (PET) and Magnetic Resonance Imaging (MRI) (Bovik, 2000).

FROM CRYPTOGRAPHY TO WATERMARKING

Though security is a general term used in the literature, the way in which security is used in the daily lives of humans is extraordinary. It ranges from passwords that are used for entering the secure computers and electronic wallets, to fingerprint scanning technology that is used for personal identification. Thereby, the security measurements became a part of the daily lives of humans as telephones or automobiles. The human's daily lives are surrounded by a world of secret communication, where people of all types are transmitting information as innocent as an encrypted credit card number to an online store then and as dangerous as a hijacking plan to terrorists. Hence, secure secret communication became essential. The secret communication can be achieved by two techniques. They are cryptography and data hiding (also referred to as information hiding).