

Chapter 102

Security in Digital Images: From Information Hiding Perspective

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ABSTRACT

Due to the swift growth of the using of the digital multimedia in the internet these days, the security in digital images has become a very important issue. Lately, significant attentions are given by many researchers in the field of the security for digital images, and several image encryption techniques have been developed to improve the security levels of these images. Different techniques can be applied to protect intellectual property rights for digital images and prohibit illegal copying. The aim of this chapter is to introduce the most important techniques that have been developed to implement the security in digital images such as digital watermarking and image steganography.

INTRODUCTION

Image processing can be defined as “the manipulation of an image for the purpose of either extracting information from the image or producing an alternative representation of the image” (Rafael & Richard, 2002). Image processing has several stimuli that may be categorized into the following:

- To implement the security levels to face attacks versus the images such as: copyright violations or image integrity.
- To eliminate undesirable components those are distorting the image or to improve the pictorial information in order to be interpreted by human.

- To elicit useful description and representation by showing the images in a more evident shape.

Digital images have been lately implemented in many several fields and disciplines. However, with some types of computer programs, those images and its data can be duplicated or modified easily. If these duplications or modifications are illegal, then they will make us questionable when considering the digital images as proof in a legal issue. The differentiations between digital images and the nature of texts, the traditional textual security techniques are not adequate to be implemented on the digital images for two major causes (Alireza & Woo, 2011):

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- The size of text format is mainly much smaller than image. Thus, to secure and encrypt the data of image, the traditional techniques of cryptosystems require much time to be implemented.
- When the text is decrypted, then the resulted text must be matched with the original text. However, this issue and rule is not necessary to be always true with the images.

With the growing use of multimedia applications such as image processing applications, the security has espoused a significant manner on the storage of images and communication. In the literature of the security of multimedia information system, there is no comprehensive or thorough review for two causes (Shiguo et al., 2009):

- The variety and intricacy of security issues and the congruous protection in the multimedia information system could be varied.
- The nature of multimedia systems is emerging continually, which fetch emerging security threats and their solutions continually as well.

The sharing of digital data became easier than ever because propagation and existence of: computer networks, storage tools, and imaging devices. Such type of sharing data; however, the questions on “how sensitive information can be protected?” have increasingly needed to be answered. For instance, when the user of digital camera in the mobile-phone needs to enhance and improve his private picture with one of the online image processing applications. The user who owns the picture concerns the privacy of his picture. At the other side, the online application (image processing website) concerns the issues of the protection by improvement the technologies against any attacks. The goals of image security are mainly found to ensure the following issues:

1. The originality of the image, and proprietorship of the creator or the sender of the image.
2. The safety of the data image, by ensuring that the image had not been changed.
3. Privacy, by protecting the proprietorship and content of the data.

Recently, digital media protection will be a mandatory issue with the growing of distributed multimedia systems. This is specifically significant for the protection and implementation of some types of intellectual rights such as copyright. The protection of copyright includes the authorization of image proprietorship, and it may include the recognition of unauthorized or illegal copies of a digital image. In order to prohibit the unauthorized or illegal distribution or copying the digital media like images, many number techniques were needed. In the case of placing the digital images on the internet imposes them at danger of steal and replacement especially when no protection techniques were used.

One of the most important techniques which enforce such sensitive data, images and copyrights is an image watermarking (Chang et al., 2002 ; Ruanaidh et al., 1996 ; Shih & Wu, 2005). Another science or technique to do the same task is cryptography by securing data which dismantles it using some encryption algorithms (Highland, 1997 ; William, 2003). Steganography is developing and a very robust technique for securing data because it does not provide evidence to doubtful. It can be defined as “an art and science of hiding data in other innocuous medium” (Artz, 2002 ; Wang & Wang, 2004 ; Altaay et al, 2012).

Three mandatory characteristics must be imposed by security of images, as mentioned in (Fridrich et al, 2002):

- **Confidentiality:** The images will be used and accessed by only the authorized persons.
- **Reliability:** Can be taken from two perspectives:

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