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Abstract

Sensor pattern noise (SPN) has been widely used in source camera identification. However, the SPN extracted from natural image may be contaminated by its content and eventually introduce side effect to the identification accuracy. In this paper, an effective source camera identification scheme based on guided image estimation and block weighted average is proposed. Before the SPN extraction, an adaptive SPN estimator based on image content is implemented to reduce the influence of image scene and improve the quality of the SPN. Furthermore, a novel camera reference SPN construction method is put forward by using some ordinary images, instead of the blue sky images in the previous schemes, and a block weighted average approach is used to suppress the influence of the image scenes in the reference SPN. Experimental results and analysis indicate that the proposed method can effectively identify the source of the natural image, especially in actual forensics environment with a small number of images.

Keywords: Source camera identification, Guided image filtering, Block weighted average, Sensor pattern noise

1. Introduction

With the rapid development of digital imaging devices, portable video camera, digital camera and mobile phone have been widely used in daily life. Digital image acquisition, publishing and sharing are becoming popular information transmission and exchange means in modern social network. Meanwhile, some powerful and easy-to-use digital image processing software provide simple tools to retouch digital images. As it brings convenience to us, the security concerns of the digital image have been attracted wide attention in the past decade, especially in the field of judicial and criminal investigation. Therefore, as a kind of multimedia security technology, digital image forensics can be used to verify the originality, authenticity and reliability of digital images.

Image source identification is an important branch of digital image forensics. It can accurately and reliably match the specific digital image with its source. Typical image source identification contains two categories. One is image acquisition pipeline identification. The target is to distinguish images taken from digital camera, images created by computer graphics or images produced by scanners; the other is the identification of camera brands or types, and it aims to identify which brand or individual camera is used for a given image. In this paper, the work will be focused on the second type, which is also called as source camera identification.

Natural image is the reflection of the light from the natural scene obtained by the camera. The acquisition of an image with a digital camera is illustrated in Fig. 1. The light reflected from the natural scene first passes through a camera lens. The function of the lens is to filter out other colors of light, and only permit red, green and blue to pass through it. CCD sensor will transform light intensity into voltage/current. For cost consideration, only one color is recorded at each position of the CCD with a color filter array (CFA) pattern. After A/D transform, the rest two colors are obtained by a CFA interpolation algorithm. After that, a sequence of image post-processing operations, such as white balancing, Gamma correction, contrast enhancement and JPEG compression, are performed to generate a digital

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