DEVELOPING FORENSIC TOOLS TO DETERMINE THE ORIGIN OR VERIFY THE AUTHENTICITY OF A DIGITAL IMAGE

MANNAM BEULAH RANI, Assistant Professor, Dept. of Computer Science, SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA,Vijayawada,A.P., India.

Abstract: In this paper, we are interested in forensics analysis of images captured by scanners. Unlike camera images, scanned images usually contain additional features produced in the pre-scanning stage, such as noise patterns or artifacts generated by the devices producing the "hard-copy" image or document. These scannerindependent features increase the difficulty in scanner model identification. Many scanners also use 1D "line" sensors, which are different than the 2D "area" sensors used in cameras. Previous work in scanner classification and scanned image forensics mainly focus on handcrafted feature extraction.

INTRODUCTION

A number of methods have been developed for digital image forensics. For example, forensic tools have been developed to detect copy-move attacks [1], [2] and splicing attacks [3]. Methods are also able to identify the manipulated region regardless of the manipulation types [4], [5]. Other tools are able to identify the digital image capture device used to acquire the image [6], [7], [8], which can be a first step in many types of image forensics analysis. The capture of "real" digital images (not computer-generated images) can be roughly divided into two categories: digital cameras and scanners.They extract features unrelated to image content, such as sensor pattern noise [9], dust and scratches [10]. In [12], Gou et al. extract statistical features from images and use principle component analysis (PCA) and support vector machine (SVM) to do scanner model identification. The goal is to classify an image based on scanner model rather than the

exact instance of the image. In [9], linear discriminant analysis (LDA) and SVM are used with the features which describe the noise pattern of a scanned image to identify the scanner model. This method achieves high classification accuracy and is robust under various post-processing (e.g. , contrast stretching and sharpening). In [10], Dirik et al. propose to use the impurities (i.e. , dirt) on the scanner pane to identify the scanning device.

LITERATURE SURVEY

1. A natural image model approach to splicing detection

Image splicing detection is of fundamental importance in digital forensics and therefore has attracted increasing attention recently. In this paper, we propose a blind, passive, yet effective splicing detection approach based on a natural image model. This natural image model consists of statistical features extracted from the given test image as well as 2-D arrays generated by applying to the test images

multi-size block discrete cosine transform (MBDCT). The statistical features include moments of characteristic functions of wavelet subbands and Markov transition probabilities of difference 2-D arrays. To evaluate the performance of our proposed model, we further present a concrete implementation of this model that has been designed for and applied to the Columbia Image Splicing Detection Evaluation Dataset. Our experimental works have demonstrated that this new splicing detection scheme outperforms the state of the art by a significant margin when applied to the above-mentioned dataset, indicating that the proposed approach possesses promising capability in splicing detection.

2. An efficient and robust method for detecting copy-move forgery

Copy-move forgery is a specific type of image tampering, where a part of the image is copied and pasted on another part of the same image. In this paper, we propose a new approach for detecting copy-move forgery in digital images, which is considerably more robust to lossy compression, scaling and rotation type of manipulations. Also, to improve the computational complexity in detecting the duplicated image regions, we propose to use the notion of counting bloom filters as an alternative to lexicographic sorting, which is a common component of most of the proposed copy-move forgery detection schemes. Our experimental results show that the proposed features can detect duplicated region in the images very accurately, even when the copied region was undergone severe image manipulations. In addition, it is observed that use of counting bloom filters offers a considerable improvement in time efficiency

at the expense of a slight reduction in the robustness.

3. Digital camera identification from sensor pattern noise

In this paper, we propose a new method for the problem of digital camera identification from its images based on the sensor's pattern noise. For each camera under investigation, we first determine its reference pattern noise, which serves as a unique identification fingerprint. This is achieved by averaging the noise obtained from multiple images using a denoising filter. To identify the camera from a given image, we consider the reference pattern noise as a spread-spectrum watermark, whose presence in the image is established by using a correlation detector. Experiments on approximately 320 images taken with nine consumer digital cameras are used to estimate false alarm rates and false rejection rates. Additionally, we study how the error rates change with common image processing, such as JPEG compression or gamma correction.

EXISTING SYSTEM

With powerful image editing tools such as Photoshop and GIMP being easily accessible, image manipulation has become very easy. Hence, developing forensic tools to determine the origin or verify the authenticity of a digital image is important. These tools provide an indication as to whether an image is modified and the region where the modification has occurred. A number of methods have been developed for digital image forensics. For example, forensic tools have been developed to detect copy-move attacks and splicing attacks.

DISADVANTAGES

Less accuracy.

PROPOSED SYSTEM

In this paper, we propose a CNN-based system for scanner model identification. We will investigate the reduction of the network depth and number of parameters to account for small image patches (i.e. , 64 × 64 pixels) while keeping the time for training in a reasonable range. Inspired by [16], we propose a network that is light-weight and also combines the advantages of ResNet [14] and GoogleNet [15]. The proposed system can achieve a good classification accuracy and generate a reliability map (i.e. , a heat map, to indicate the suspected manipulated region).

The proposed system an input image is first split into smaller sub-images Is of size n ×m pixels. This is done for four reasons: a) to deal with large scanned images at native resolution, b) to take location independence into account, c) to enlarge the dataset, and d) to provide low pre-processing time.

ADVANTAGES

More accurate.

SYSTEM ARCHITECTURE
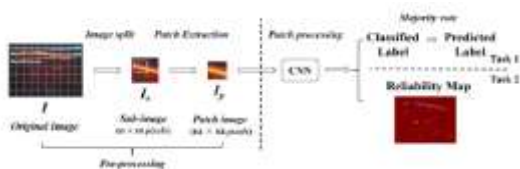
MODULES DESCRIPTION

TRAINING

A test image will first be split into sub-images, and then subsequently extracted into patches of size 64×64 pixels. The extracted patches will be used as inputs for the proposed neural network.

PRE-PROCESSING

This pre-processing enables the proposed system to work with small-size images and use smaller network architecture to save training time and memory usage. Designing suitable network architecture is an important part in the scanner model identification system.

TESTING

The same pre-processing procedure as described in the training section will be used in the testing stage. Our proposed system will evaluate two tasks on scanned images: scanner model classification and reliability map generation. In Task 1 (scanner model classification), we assign the predicted scanner labels to both patches Ip and original images I. The predicted scanner label for the sub-image is the same as the predicted label of its corresponding patch. The classification decision for the original image I is obtained by majority voting over the decisions corresponding to its individual sub-images. In Task 2, a reliability map [19] is generated based on the majority vote result from Task 1. The pixel values in the reliability map indicate the probability of the corresponding pixel in the original image being correctly classified.

CONCLUSION

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