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DETECTING FORGED IMAGES USING EDBTC FEATURE

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Abstract: Images are an important part of today's digital world. However, due to the large quantity of data is needed to represent modern imagery; the storage of such data can be expensive. Thus, the work on efficient image storage (image compression) has the potential to reduce storage costs and enable new applications. Block Truncation Coding (BTC) is a lossy image compression technique which uses moment preserving quantization method for compressing digital grayscale images. Even though this method retains the visual quality of the reconstructed image with good compression ratio, it shows some artifacts like blocking effect and false contouringthis work presents a new method on image forensics application using the Error Diffusion Block Truncation Coding (EDBTC) feature. The image forensics tries to detect the copy-move forgery image regions on the forged image. Firstly, an image is divided into several non-overlapping image blocks. The image feature is further derived for each image block. Herein, two image features, namely Color Feature (CF) and Bit Feature (BF), are composed from the EDBTC compressed data stream. The forged region is detected while the image feature of this region is similar to the image feature of other region separated far away. The proposed method gives a promising result on the image forensics task, and, at the same time, outperforms the former existing scheme.

Keywords: Image Compression, Block Transaction Coding, Color Feature.

I. INTRODUCTION

An image refers to a 2D light intensity function f(x,y), where (x,y) denote spatial coordinates and the value of f at any point (x,y) is proportional to the brightness or gray levels of the image at that point.A digital image is an image f(x,y) that has been discretized both in spatial coordinates and brightness. The elements of such a digital array are called image elements or pixelsTo be suitable for computer processing, an imagef(x,y) must be digitalized both spatially and in amplitudeDigitization of the spatial co-ordinates (x,y) is called Image SamplingAmplitude digitization is called gray-level quantizationThe storage and processing requirements increase rapidly with the spatial resolution and the number of gray levelsExample: A 256 gray-level image of size 256x256 occupies 64K bytes of memoryImages of very low spatial resolution produce a checkerboard effect

FUNDAMENTAL STEPS IN IMAGE PROCESSING

1. Image acquisition: to acquire a digital image

2. Image preprocessing: to improve the image in ways that increase the chances for success of the other processes.

3. Image segmentation: to partitions an input image into its constituent parts or objects.

4. Image representation: to convert the input data to a form suitable for computer processing.

5. Image description: to extract features that result in some quantitative information of interest or features that are basic for differentiating one class of objects from another.

6. Image recognition: to assign a label to an object based on the information provided by its descriptors.

7. Image interpretation: to assign meaning to an ensemble of recognized objects.

Knowledge about a problem domain is coded into an image processing system in the form of a knowledge database.

EDBTC

Data EDBTC method is formerly proposed for grayscale image compression by employing a specific error kernel such as Floyd-Steinberg. The EDBTC gains popularity since of its simplicity and parallelism mechanism offered by EDBTC. Some efforts have been devoted to further improve the EDBTC performance as well as to extend its usability. The current researches show that the EDBTC is not only suitable for grayscale image compression, but it also yields a good result for color image compression, image retrieval, image classification, etc.

This research tries to extend usability and successfulness of EDBTC image feature into the other research domain. Herein, the EDBTC image feature is broaden for the image forensics. This task detects the copy-and-move image region using EDBTC image feature. The EDBTC requires low computational burden in order to generate the compressed data stream. In recent years, digital image tampering is made easier due to the availability of commercial photo editing software, free or paid. For example, such software has made it easier to duplicate and manipulate the image's content without (significantly) degrading its quality or leaving any visible clues to an

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untrained eye (depending on the skills of the user, the software used, etc). In addition, the images that are widely shared over the social media on the internet can be easily altered to misrepresent their meaning with malicious intention.

Digital image tampering or manipulation has also been detected in academic papers. For example, in the survey conducted by Tijdink et al. (2014), 15% of the respondents admittedly engaged in scientific misconduct such as fabricating, falsifying, plagiarizing, or manipulating data in the past three years. Another study also reported that approximately 20% of accepted manuscripts in the Journal of Cell Biology contain inappropriate figure manipulations and at least 1% of them have fraudulent manipulations (Farid, 2006). Consequently, the credibility of the research outcomes can be challenged and in some cases, result in allegations of scientific misconduct. For example, a professor in Missouri University retracted his publication entitled “CDX2 gene expression and trophectoderm lineage specification in mouse embryos” published in the Feb. 17, 2006, issue of Science.

The reality and integrality of digital images are suffering badly threats. In consequence, it is vital and urgent to discover the skill to distinguish the truth from the false images. Naturally, digital image forensics technology is a new research area under this background. It can be divided into active evidence and passive-blind evidence based on whether the additional information is embedded into digital images in advance or not. Active evidence is mainly about watermark, but it has many disadvantages: What is embedded with watermark makes the quality of the picture a decline. At present, many of the digital cameras have not been imbedded the function of watermark. Watermark is easy to attack and destroy.

When we obtain the evidence, we need a third institute to be involved in, of course, the third institute needs accepting by the recognition of the two sides and the court. Therefore, the passive-blind evidence that detects the changed regions only by depending on the content itself will become a research topic of digital image forensics technology.

A subsequent investigation revealed that one of the images was manipulated. The researcher was subsequently found guilty of intentionally manipulating the image of the embryo. These issues have resulted in a renewed interest in image forensics research to authenticate image, identify image manipulation etc.,

II EXISITNG SYSTEM

Many former schemes have been developed to improve the retrieval accuracy in the content-based image retrieval (CBIR) system. The image features are directly constructed from the typical block truncation coding (BTC) or half toning-based BTC compressed data stream without performing the decoding process. BTC compresses an image into a new domain by dividing the original image into multiple non overlapped image blocks, and every block is then represented with two extreme quantizers (i.e., high and low mean values) and bitmap image. Two sub images constructed by the two quantizes and the corresponding bitmap image are produced at the end of BTC encoding stage, which are later transmitted into the decoder module through the transmitter. To generate the bitmap image, the BTC scheme performs thresholding operation using the mean of every image block such that a pixel value greater than the mean value is regarded as one (white pixel) and vice versa.

LIMITATIONS

- BTC method doesn't improve the image quality or compression ratio compared with JPEG or JPEG 2000
- It often suffers from blocking effect and false contour problems
- Making it less satisfactory for human perception

III PROPOSED SYSTEM

The EDBTC gains popularity since of its simplicity and parallelism mechanism offered by EDBTC. The EDBTC image feature is broaden for the image forensics. This task detects the copy-and-move image region using EDBTC image feature. Decompose the forged image into several image block. The image block obtained from the previous step is further divided into several non-overlapping image blocks before EDBTC processing. Derive the image feature descriptor CF and BF from the two EDBTC color quantizes and bitmap image, respectively.Perform similarity matching for all image blocks between all image blocks in whole image. The lexicographically sorting and shift vector can be employed for the proposed method to yield faster computation. Perform post-processing on the detected image regions to remove undesired or isolated detected image regions. Thus, the post-processing step reduces the misclassified image regions and improves the forgery detection rate at the same time.

ADVANTAGES

- EDBTC yields a good result for color image compression, image retrieval, image classification, etc.,
- The EDBTC requires low computational burden in order to generate the compressed
- data stream
-

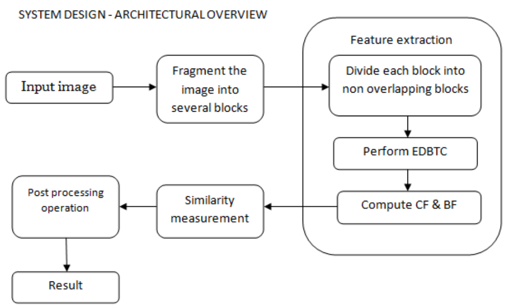

Figure No. 1System Architecture

System design is the process of defining the architecture, components, modules, and data for a system to satisfy specified requirements. There is some overlap with the disciplines of systems analysis, systems architecture and systems engineering. If the broader topic of product development blends the perspective of marketing, design, and manufacturing into a single approach to product development, then design is the act of taking the marketing information and creating the design of the product to be manufactured. System design is therefore the process of defining and developing systems to satisfy specified requirements of the user.

IV IMPLEMENTATION

Implementation is the stage in the project where the theoretical design is turned into a working system and is giving confidence on the new system for the users, which it will work efficiently and effectively. It involves careful planning, investigation of the current system and its constraints on implementation, design of methods to achieve the changeover, an evaluation, of change over methods. Apart from planning major task of preparing the implementation are education and training of users. The more complex system being implemented, the more involved will be the system analysis and the design effort required just for implementation.

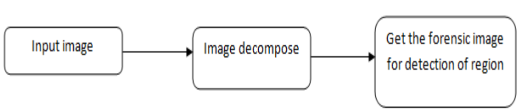

Figure No. 5.2Image decomposing module

An implementation co-ordination committee based on policies of individual organization has been appointed. The implementation process begins with preparing a plan for the implementation of the system. According to this plan, the activities are to be carried out, discussions made regarding the equipment and resources and the additional equipment has to be acquired to implement the new system. Implementation is the final and important phase, the most critical stage in achieving a successful new system and in giving the users confidence. That the new system will work be effective .The system can be implemented only after through testing is done and if it found to working according to the specification. This method also offers the greatest security since the old system can take over if the errors are found or inability to handle certain type of transactions while using the new system.

3MODULES:

1. Image decomposing module
2. Feature extraction
3. Similarity measure
4. Post Processing

Image Decomposing Module:

The RGB color image F of size $M\times N$ is firstly divided into several non-overlapping image blocks of size $m\times n$ denoted as $f(x,y)$, where x=1,2,…,m and y=1,2,…,n. Thus, one can obtain in total $Mm\times Nn$ image blocks after this image block division. Decompose the forged image into several image block. Firstly, an input image, i.e. forged image, is divided into several overlapping image blocks. In our proposed method, the image block is of size 8×8. This image block size is almost identical to the other schemes in the copy-move-forgery detection task.

5.3.2 Feature extraction:

The image block obtained from the previous step is further divided into several non-overlapping image blocks before EDBTC processing. Error Diffusion Block Truncation Coding is implemented on several non overlapping blocks to derive CF and BF. Derive the image feature descriptor CF and BF from the two EDBTC color quantizers and bitmap image, respectively. The proposed method simply utilizes the feature dimensionality as 16. Where the color and bit pattern codebook size are Nc=8 and Nb=8.

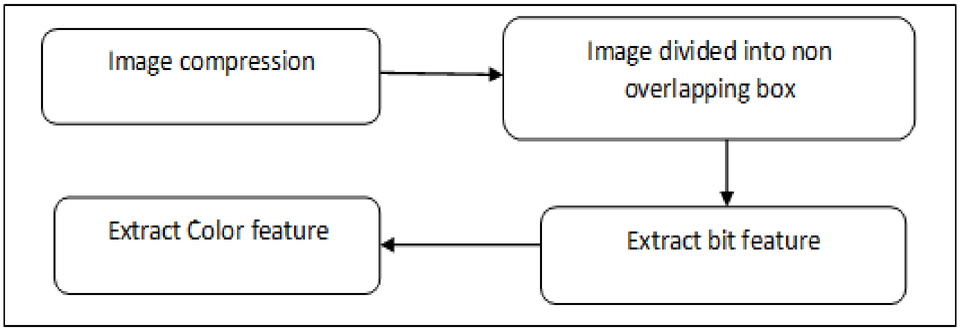

Figure No. 5.3 Feature extraction

Error Diffusion Blocking Truncation Coding

The proposed system is Error Diffusion Block Truncation Coding. In this method input image is compressed using EDBTC. The output of EDBTC compression is two quantizers i.e., maximum quantizers and maximum quantize and a bitmap image. The disadvantages of existing system BTC can be overcome with Error Diffusion BTC (EDBTC).EDBTC solved the blocking effect and false counter problems. Image compression ratio is improved.

EDBTC Compression

The EDBTC compresses an image in an effectively way by incorporating the error diffusion kernel to generate a bitmap image. Simultaneously, it produces two extreme quantizers, namely minimum and maximum quantizers. The EDBTC scheme offers a great advantage in its low computational complexity in the bitmap image and two extreme quantizer's generation. In addition, EDBTC scheme produces better image quality compared to the classical BTC approaches. The detail explanation and comparison between EDBTC and BTC-based image compression. BTC and EDBTC have the same characteristic in which the bitmap image and the two extreme values are produced at the end of the encoding stage. In BTC scheme, the two quantizers and its image bitmap are produced by computing the first moment, second moment, and variance value, causing a high computational burden. Suppose a color image of size $M \times N$ is partitioned into multiple non overlapping image blocks of size $m \times n$.

Let $f(x, y) = \{fR(x, y), fG(x, y), fB(x, y)\}$

be an image block, where $x = 1,2, \dots , m$ and $y = 1,2, \dots , n$. For each image block, the EDBTC produces a single bitmap image bm(x, y), and two extreme (color) quantizers (q_{min} and q_{max}). The bitmap image size is identical to that of the original image size. The EDBTC exploits the dithering property of the error diffusion to overcome the false contour problem normally occurred in BTC compression. Moreover, the blocking effect can also be eased by its error kernel, since the quantization error on one side of the boundary can be compensated by the other side of the boundary. The correlation on both sides of a boundary between any pair of resulting image blocks can be maintained. The EDBTC bitmap image can be obtained by performing thresholding of the inter-band average value with the error kernel. In a block-based process, the raster-scan path (from left to right and top to bottom) is applied to process each pixel in a given image. Suppose that f(x, y) and $\overline{f}(x, y)$ denote the original and inter-band average value, respectively. The inter-band average value can be computed as:

$$\overline{f}(x, y) = 1/3\ (f_R(x, y) + f_G(x, y) + f_B(x, y)). \quad (1)$$

The $f_R(x, y)$, $f_G(x, y)$, and $f_B(x, y)$ denote the image pixels in the red, green, and blue color channels, respectively. The inter-band average image can be viewed as the grayscale version of a color image. The EDBTC performs the thresholding operation by incorporating the error kernel. We firstly need to compute the minimum, maximum, and mean value of the inter-band average pixels as follows:

$$xmin=min\forall x,y\overline{f}(x,y), \quad (2)$$

$$xmax = max\ \forall x,y\ \overline{f}(x, y), \quad (3)$$

$$\overline{x} = \sum \sum \overline{f}(x, y)\ n\ y=1\ m\ x=1\ . \quad (4)$$

The bitmap image h(x, y) is generated using the following rule:

$$h(x, y) = \{\ 1, \text{if } \overline{f}(x, y) \geq \overline{x};$$

$$0, \text{if } \overline{f}(x, y) < \overline{x}. \quad (5)$$

The intermediate value o(x, y) is also generated at the same time with the bitmap image generation. The value o(x, y) can be computed as

$$o(x, y) = \{\ xmax, \text{if } h(x, y) = 1;$$

$$xmin, \text{if } h(x, y) = 0. \quad (6)$$

$$e(x, y) = \overline{f}(x, y) - o(x, y), \quad (7)$$

The EDBTC thresholding process is performed in a consecutive way. One pixel is only processed once, and the residual quantization error is diffused and accumulated into the neighboring un-processed pixels. The value $\overline{f}(x, y)$ of un-processed yet pixel is updated using the following strategy:

$$\overline{f}(x, y) = \overline{f}(x, y) + e(x, y) * \epsilon, \quad (8)$$

where ϵ is the error kernel to diffuse the quantization residual into its neighboring pixels which have not yet been processed in the EDBTC thresholding. The symbol $*$ denotes the convolution operation. The reason of choosing the extreme values to represent an image block is to generate a dithered result (bit pattern illusion) to reduce the annoying blocking effect or false contour inherently existing in BTC images. Notably, the error at the boundary of an image block should be diffused to its neighboring blocks, thus the blocking effect can be significantly eased in the EDBTC reconstructed image.

V Conclusion

The correctness of the proposed method under visual investigation has been validated and concluded. Herein, the detected regions of forged image are visually observed by human vision. Firstly, the tampered image regions are determined by user on the specific position over forged image. The proposed image forensics method tries to detect the tampered image regions automatically. The proposed method delivers results on detecting the tampered image regions. The detected image regions can be easily confirmed by human vision. From this experiment, the proposed method yields correct result on detecting tampered image regions for the image forensics application.

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