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Informatica

Illuminant inconsistencies based methods for image splicing detection

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Introduction

Digital images are easy to manipulate thanks to the availability of the **powerful editing software** and **sophisticated digital cameras**.

The development of methods for verifying **image authenticity** is a real need in forensics.

Purpose: to detect image splicing aimed at *deceiving* the viewer.



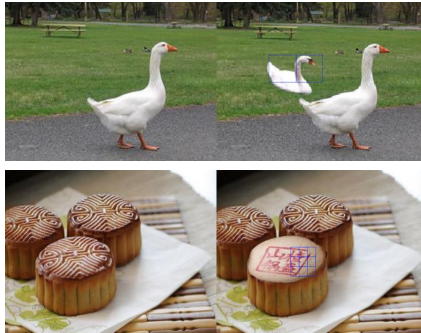
Forgery detection

Image splicing detection techniques are based on *inconsistencies*:

1. **Image resampling, copy-paste:** deduced from image metadata.
2. **Compression-based inconsistencies:** JPEG compression introduces blocking artifacts. Manufacturers of digital cameras and image processing software typically use different JPEG quantization tables.
3. **Neighboring pixels relationship inconsistencies:** when an image is spliced some artifacts can be created.
4. **Intrinsic image properties inconsistencies:** e.g. scene lights, shadows or perspective.

Lighting-based inconsistencies

Methods based on **Lighting inconsistencies** are particularly *robust*: a perfect illumination adjustment in a image composition is very hard to achieve.



Lighting-based inconsistencies

These methods can be divided into two types of approaches:

1. **Object light inconsistencies:** involving light source position estimation or a full illumination model reconstruction. It can be done using *shadows*, *face geometry*, *generic object surfaces*.
2. **Illuminant colors inconsistencies:** assuming that a scene is lit by the same light source, all objects must have the same illuminant colors.



Riferimenti bibliografici

- [1] I. Amerini, R. Caldelli, P. Crescenzi, A. D. Mastio, and A. Marino. Blind image clustering based on the normalized cuts criterion for camera identification. *Signal Processing: Image Communication*, 29(8):831 – 843, 2014.
- [2] I. Daubechies. *Ten Lectures on Wavelets*. Society for Industrial and Applied Mathematics, Philadelphia, PA, USA, 1992.
- [3] M. Goljan, M. Chen, P. Comesana, and J. Fridrich. Effect of compression on sensor-fingerprint based camera identification. *Electronic Imaging*, 2016(8):1–10, 2016.
- [4] H. Muammar. Source camera identification using image sensor prnu pattern. Department of Electrical and Electronic Engineering, Imperial College, London.