**State of the Art report for deliverable 2.1**

**MOD4**

**Overall description**

The MOD4 of Fence deals with splicing detection observing the 2D lighting inconsistencies in the image, based on the fact that a perfect illumination adjustment in an image composition is very hard to achieve.

In particular MOD4 aims at detecting if a given image is pristine or not and, in case it is fake, highlight the splicing in a generic image with a blind approach.

**Main sub-modules:**

1. Image illuminant maps estimation
2. Image segmentation
3. Single image segment classification
4. Integrity decision and fake image parts highlighting

Related State of the Art Review

Investigating image’s lighting is one of the most common approaches for splicing detection. This approach is particularly robust because of the fact that it's really hard to preserve the consistency of light dealing with forgeries.

In this scenario, there are mainly two types of approaches: the one based on the object-light geometric arrangement and the one based on illuminant colors. We focused our attention on the illuminant-based approach, which assumes that a scene is lit by the same light source. In this condition, single scenes have unique illuminant colors, potential inconsistencies could be used for splicing detection.

Illuminant Maps locally describes the lighting in a small region of the image. In the computer vision literature exists many different approaches for determining the illuminant of an image and they are divided into two groups*: statistical-based* approaches and *physics-based* approaches.

Per quanto riguarda il primo gruppo, il metodo proposto da [3], chiamato GGE è un’estensione del metodo GrayWorld proposto da Wu and Fang [CITA]. The main assumption on which this method is based on is that, under a white light source, the average pixel color in a scene is achromatic.

Per il secondo gruppo, è stato considerate il metodo proposto da Riess [CITA] chiamato IIC. I metodi di questo tipo cercano di modellare gli illuminant colors considerando il dichromatic reflection model.

In un articolo pubblicato da Carvalho [CITA], viene evidenziato che la differenza fra le due mappe GGE e IIC aumentava quando venivano elaborate immagini modificate. Questa intuizione porta all’idea della possibilità di discriminare se una parte dell’immagine è stata alterata semplicemente tramite una metrica definita tra le due IMs.

Questo lavoro porta alla

References:

[1] T. Carvalho, et al. Illuminant-Based Transformed Spaces for Image Forensics. IEEE Transactions on Information Forensics and Security 11.4 (2016): 720-733.

[2] V. Schetinger et al. Exploring Statistical Di↵erences Between Illuminant Estimation Methods for Exposing Digital Forgeries; 2016.

[3] J. van de Weijer, Th. Gevers, A. Gijsenij, Edge-Based Color Constancy, IEEE Trans. Image Processing, accepted 2007.

[4] C. Riess and E. Angelopoulou. 2010. Scene illumination as an indicator of image manipulation. In Proceedings of the 12th international conference on Information hiding, Berlin, Heidelberg, 66-80.

[1] Gholap, Sandeep, and P. K. Bora. Illuminant colour based image forensics. TENCON 2008-2008 IEEE Region 10 Conference. IEEE, 2008.

[2] Wu, Xuemin, and Zhen Fang. Image splicing detection using illuminant color inconsistency. Third International Conference on Multimedia Information Networking and Security. IEEE, 2011.

[3] C. Riess and E. Angelopoulou. 2010. Scene illumination as an indicator of image manipulation. In Proceedings of the 12th international conference on Information hiding, Berlin, Heidelberg, 66-80.

[4] T. Carvalho, et al. Exposing digital image forgeries by illumination color classification. IEEE transactions on information forensics and security 8.7 (2013): 1182-1194.

[5] T. Carvalho, et al. Illuminant-Based Transformed Spaces for Image Forensics. IEEE Transactions on Information Forensics and Security 11.4 (2016): 720-733.

[6] V. Schetinger et al. Exploring Statistical Differences Between Illuminant Estimation Methods for Exposing Digital Forgeries; 2016.