

Overview of ghost correction for HDR video stream generation

Mustapha Bouderbane, Pierre-Jean Lapray, Julien Dubois, Barthélémy Heyrman, Dominique Ginhac

▶ To cite this version:

Mustapha Bouderbane, Pierre-Jean Lapray, Julien Dubois, Barthélémy Heyrman, Dominique Ginhac. Overview of ghost correction for HDR video stream generation. 4th Workshop on the Architecture of Smart Cameras, Jun 2015, Santiago de Compostella, Spain. hal-01196884

HAL Id: hal-01196884 https://u-bourgogne.hal.science/hal-01196884

Submitted on 10 Sep 2015

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers. L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Overview of ghost correction for HDR video stream generation

Mustapha Bouderbane, Pierre-Jean Lapray, Julien Dubois,
Barthélémy Heyrman, Dominique Ginhac
Laboratory Le2i, UMR CNRS 6306
University of Bourgogne, France
Contact Email: Mustapha.Bouderbane@u-bourgogne.fr

Most digital cameras use low dynamic range image sensors, these LDR sensors can capture only a limited luminance dynamic range of the scene[1], to about two orders of magnitude (about 256 to 1024 levels). However, the dynamic range of real-world scenes varies over several orders of magnitude (10.000 levels). To overcome this limitation, several methods exist for creating high dynamic range (HDR) image (expensive method uses dedicated HDR image sensor and low-cost solutions using conventional LDR image sensor). Large number of low-cost solutions applies a temporal exposure bracketing. The HDR image may be constructed with a HDR standard method (an additional step called tone mapping is required to display the HDR image on conventional system), or by fusing LDR images in different exposures time directly, providing HDR-like[2] images which can be handled directly by LDR image monitors.

Temporal exposure bracketing solution is used for static scenes but it cannot be applied directly for dynamic scenes or HDR videos since camera or object motion in bracketed exposures creates artifacts called ghost[3], in HDR image. There are a several technics allowing the detection and removing ghost artifacts (Variance based ghost detection, Entropy based ghost detection, Bitmap based ghost detection, Graph-Cuts based ghost detection ...) [4], nevertheless most of these methods are expensive in calculating time and they cannot be considered for real-time implementations.

The originality and the final goal of our work are to upgrade our current smart camera allowing HDR video stream generation with a sensor full-resolution (1280x1024) at 60 fps [5]. The HDR

stream is performed using exposure bracketing techniques (obtained with conventional LDR image sensor) combined with a tone mapping algorithm. In this paper, we propose an overview of the different methods to correct ghost artifacts which are available in the state of art. The selection of algorithms is done concerning our final goal which is real-time hardware implementation of the ghost detection and removing phases.

Keywords: high dynamic rage, exposure bracketing, ghost detection, real-time algorithm, smart camera, bitmap, entropy, Graph-Cuts.

References:

[1] Kang et al, Bayer patterned high dynamic range image reconstruction using adaptive weighting function, EURASIP Journal on Advances in Signal Processing 2014.
[2] Gelfand, N., Adams, A., Park, S. H., & Pulli, K. (2010, October). Multi-exposure imaging on mobile devices. In Proceedings of the international conference on Multimedia (pp. 823-826). ACM.

[3] Sen, P., Kalantari, N. K., Yaesoubi, M., Darabi, S., Goldman, D. B., & Shechtman, E. (2012). Robust patch-based hdr reconstruction of dynamic scenes. ACM Trans. Graph., 31(6), 203. [4] Srikantha, A., & Sidibé, D. (2012). Ghost detection and removal for high dynamic range images: Recent advances. Signal Processing: Image Communication, 27(6), 650-662. [5] Lapray, P. J., Heyrman, B., & Ginhac, D. (2014). HDR-ARtiSt: an adaptive real-time smart camera for high dynamic range imaging. Journal of Real-Time Image Processing, 1-16.