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High dynamic range imaging method based on image content adaptive matrix completion

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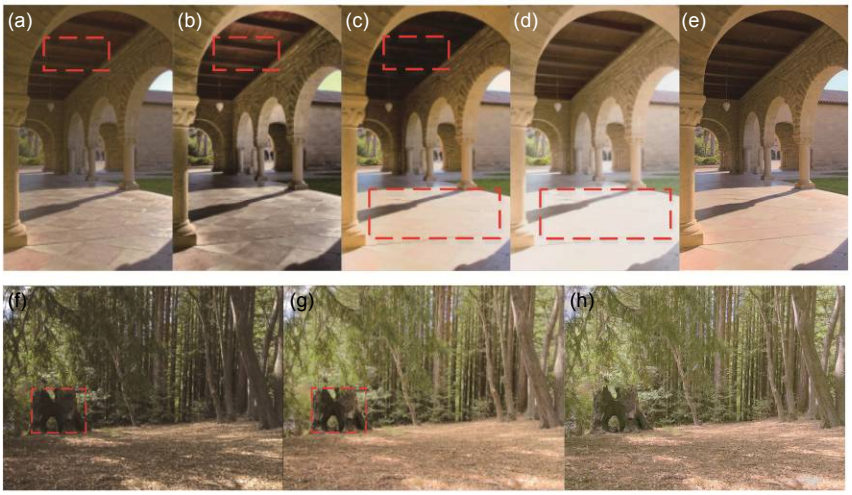

Experiment results of arch and forest sequences. (a) Zheng, et al. (b) Hu, et al. (c) Sen, et al. (d) Photoshop CS6. (e) The Poposed. (f) Gallo, et al. (g) Sen, et al. (h) The Poposed.

Abstract: High dynamic range (HDR) image is more consistent with human perception, and is being applied to many fields, such as consumer electronics, remote sensing system, intelligent transportation, security monitoring. So far, HDR imaging has usually produced ghosting artifacts, so there are many researchers carrying out the research about de-ghosting. Some researchers came up with the algorithms which can remove ghosts by detecting moving regions, and other researchers considered the fusion weight distribution to eliminate the artifacts. Recently, the algorithm that models the HDR imaging problem as a rank minimization problem is proposed. It is solved with the idea of matrix completion (MC). However, as no attention was paid to the motion characteristics of multi-exposure image, the traditional MC method could fail to completely remove the ghosts. Therefore, in order to solve this problem, according to the motion information of multi-exposure images and fusion strategy related to exposures, this paper presents a new HDR imaging method based on content adaptive MC of low dynamic range (LDR) image to remove the ghosts of HDR image. Firstly, the motion area of LDR image is obtained based on the luminance and color information of the image with the median threshold bitmap (MTB) features, the hue feature H and color saturation characteristics S. Then, based on the priori information of motion, regularization strength is adjusted in the MC process to obtain the low-rank background information of each LDR image. Finally, a fusion strategy related to multiple exposures is proposed to achieve a ghost-free HDR image, while the difference of details in each image area under different exposures is considered. Regular background sequences and cluttered background sequences are used for experiments. The experimental results demonstrate that, compared with the partial sum minimization of singular values-matrix completion method, the proposed method is more real-time and suitable for cluttered background sequences. The above figure is part of the experimental results, where (e) and (h) are the results of the proposed algorithm of Arch and Forest sequences. Compared with these algorithms, the images synthesized by the proposed algorithm not only have no ghost, but also have richer details. In addition, by calculating the processing speed of several classical algorithms and the proposed algorithm, it is shown that the proposed algorithm can reduce the computational complexity of the overall HDR imaging operation and run more efficiently.

Keywords: high dynamic range imaging; prior knowledge of motion; matrix completion; related to exposure

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