Filter Based Deghosting for Exposure Fusion Video

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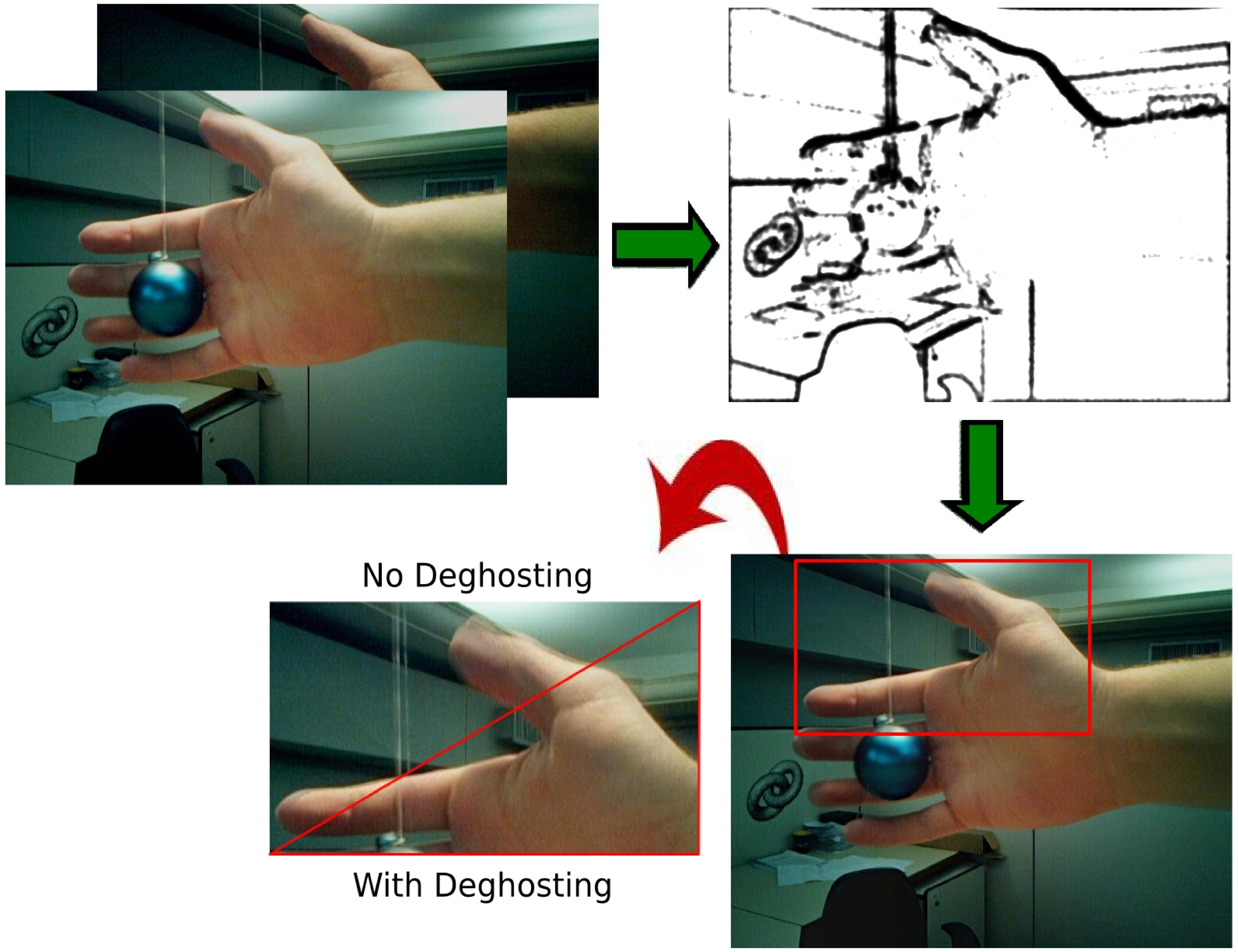
Contribution: Exposure Fusion Video Deghosting

We present a novel method that deals with the elimination of ghosting artifacts during the creation of Exposure Fusion video by using several carefully selected filters and performing a local analysis.

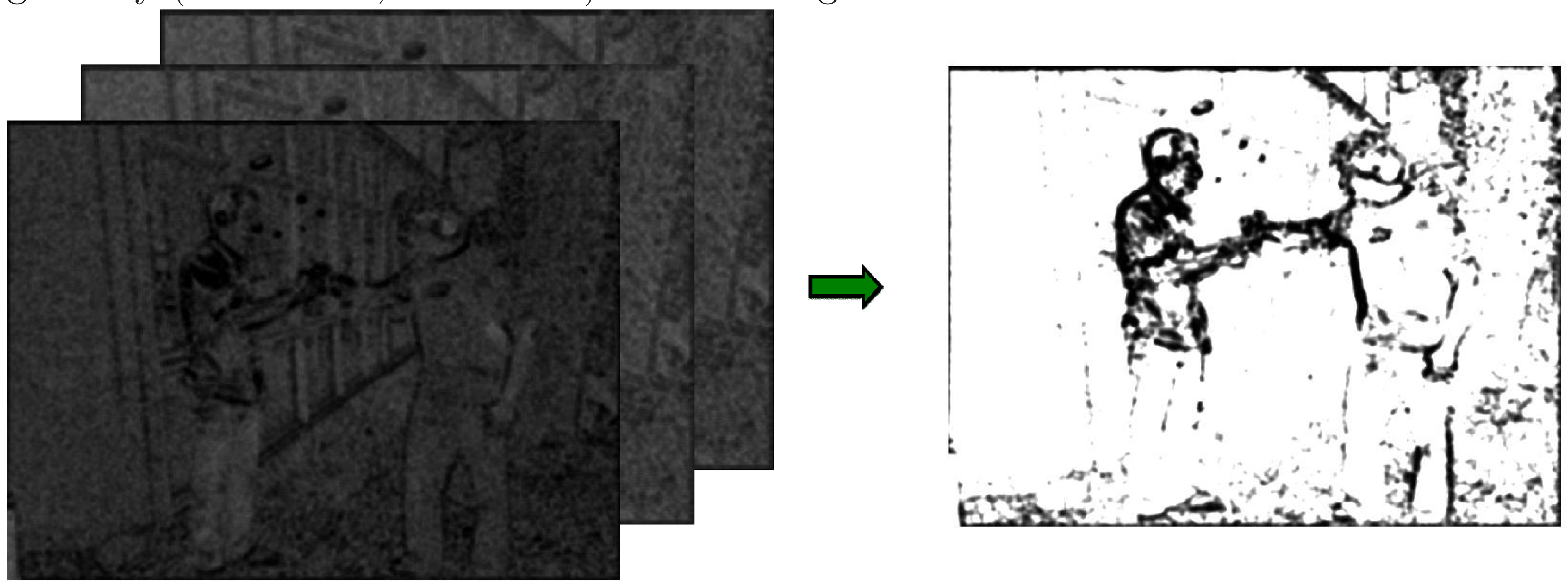


→ Input images (analyzing two frames)
→ Ghosting Coefficients
→ Resulting Deghosted image with amplified detail.

Deghosting Method

Exposure Fusion relies on three numerical parameters assigned to each pixel in the inbound images: Well-Exposedness, Detail and Saturation. We propose a fourth parameter to aid video creation - Ghosting.

The original images' color variations were found too steep due to the implicit exposure variation to generate reliable results. Thus, the process outlined below is applied to the result of a regular Low-Pass, followed by a High-Pass Laplacian filter applied to each image. To find the Ghosting parameter of pixel (i, j), $G(i, j)$ we analyze the regions A_{ij} and B_{ij} as given by $(i-l : i+l, i-l : i+l)$ in each image.



The pixel areas are evaluated according to the following formula:
$G(i, j) = 1 - ||A_{ij} - B_{ij}||$.
This method is then repeated with additional Low-Pass filter steps. The resulting obtained Ghosting coefficients are multiplied to obtain the final pixel Ghosting parameter value. This process attenuates the contribution of capture noise and irrelevant weaker high-frequencies, which disappear after consecutive Low-Pass applications, resulting in less erroneous detections of non-movement high-frequency variations and a strengthened Ghosting parameter for pixels that involve true object movement.

Methods

In order to obtain the video frames used in this work, a Nokia N900 running Maemo 5 and the FCam API was used. We proceed to perform a multiresolution alignment based on image pyramids. This step is necessary, as background pixel correspondence is crucial for this work. Both are explained in detail in our previous work [Castro et al.].

References

[1] CASTRO, T., CHAPIRO, A., CICCONET, M., AND VELHO, L. Towards Mobile HDR Video. In Eurographics 2011.
[2] GALLO, O., CHEN, W., GELFAND, N., TICO, M., AND PULLI, K. Artifact-free High Dynamic Range Imaging. In ICIP 2009.
[3] MERTENS, T., KAUTZ, J., AND VAN REETH, F. Exposure fusion. In Pacific Graphics 2007.