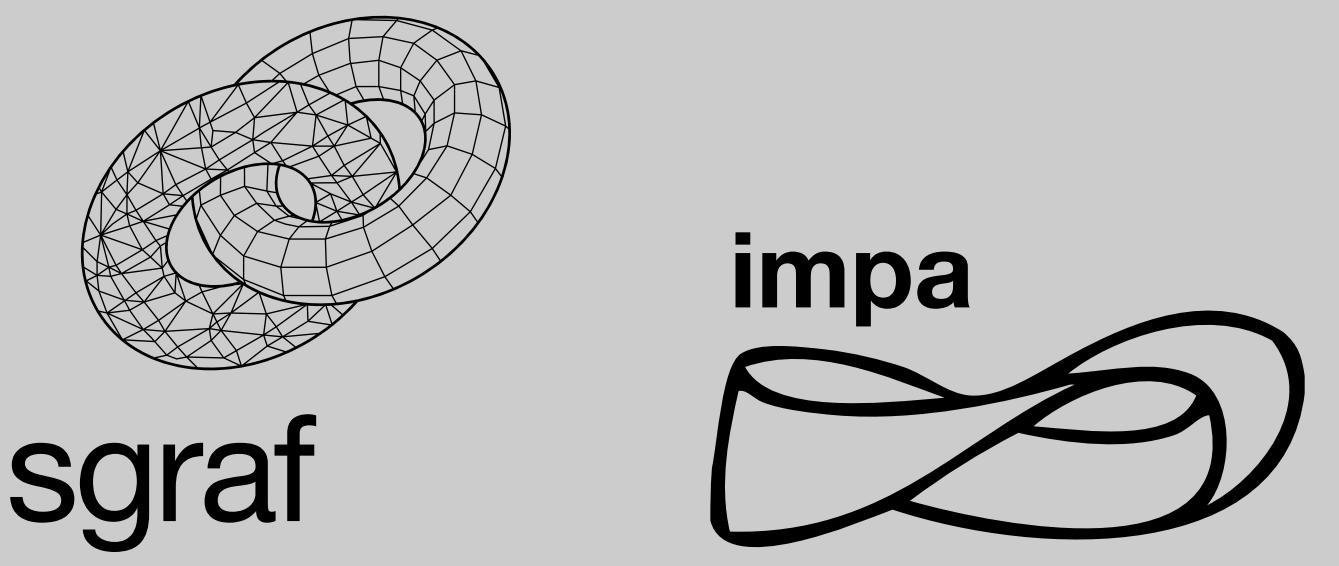


Towards Mobile HDR Video

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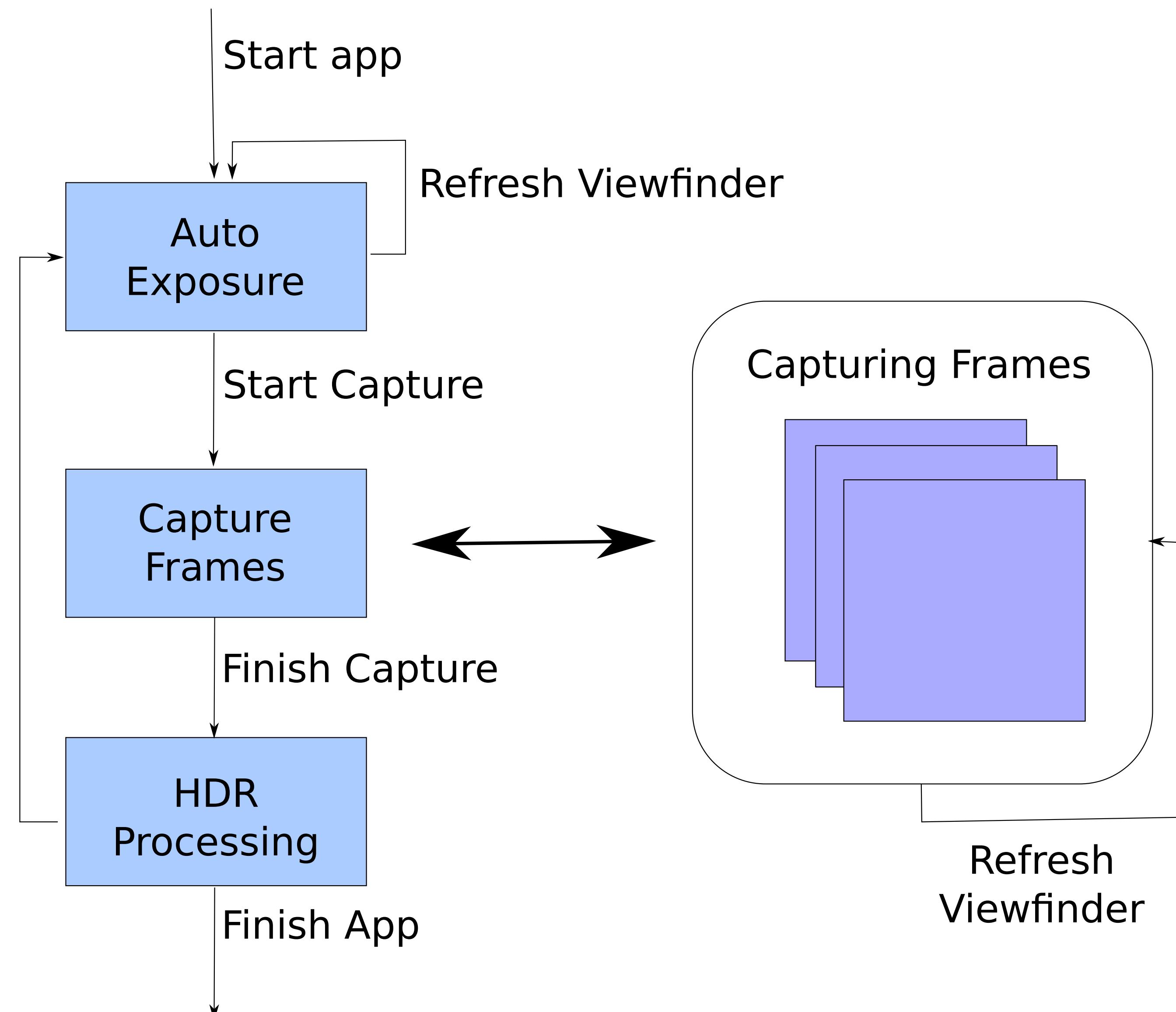


Introduction

We present a method for High Dynamic Range Video where the critical phases of the pipeline are based on histograms. It was briefly introduced in [VELHO]

- It is possible to achieve high framerates, since the algorithm generates one HDR frame per captured frame
- The method is of low computational cost, making it particularly suited for devices with less powerful processors

Capture

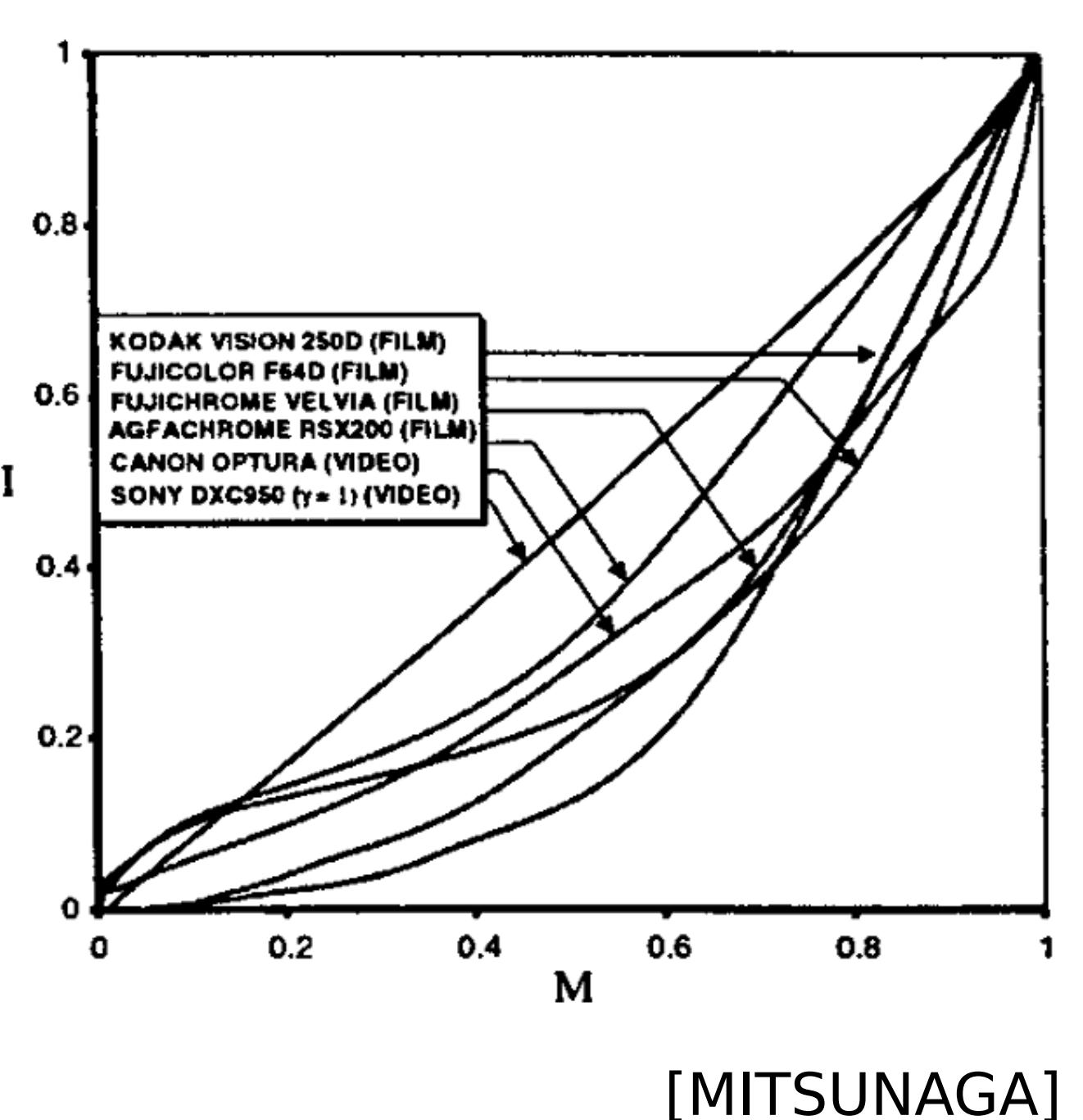


- We used a Nokia N900 running a Maemo 5 distribution. It has a 5MP programmable camera
- Exposure bracketing and autoexposure are performed during the whole capture
- The application was developed using the FCAM API [ADAMS]

Alignment



Camera Response

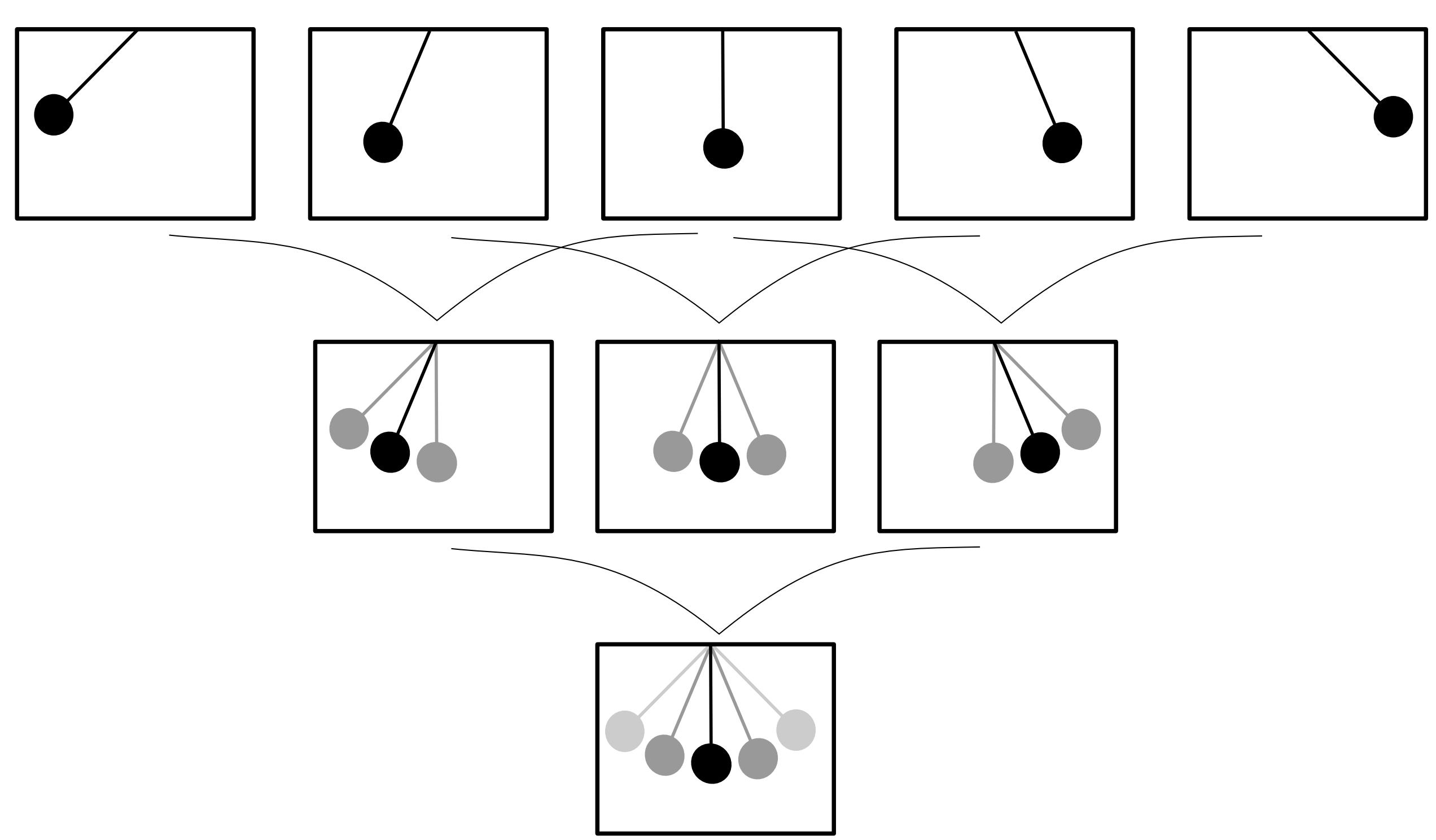


[MITSUNAGA]

[WARD]

Radiance Map Reconstruction

- For each three consecutive frames, we reconstruct three intermediate HDR images considering their immediate neighbors
- Considering the same pixel position across frames and fixing a reference frame F, these computed radiance values can be combined according to their variances. If the variance is high, some movement must have happened, and the reference pixel receives greater weight. Each frame is processed as reference, and then we average three consecutive results



Exposure Fusion for Video

- Another interesting approach to produce high quality videos is Exposure Fusion [MERTENS]. It is faster and simpler than traditional HDR, and although it does not really extend the dynamic range of a picture, the results are very promising
- It consists basically on a weighted average of the different-exposed frames, considering their well-exposedness, saturation and detail
- Its extension to video is straightforward, and some other parameters related to movement can be used to avoid ghosting

Results

HDR approach



Exposure Fusion approach



[ADAMS] - Andrew Adams, David E. Jacobs, Jennifer Dolson, Marius Tico, Kari Pulli, Eino-Ville Talvala, Boris Ajdin, Daniel Vaquero, Hendrik P. A. Lensch, Mark Horowitz, Sung Hee Park, Natasha Gelwand, Jongmin Baek, Wojciech Matusik, and Marc Levoy. 2010. The Frankencamera: an experimental platform for computational photography. ACM Trans. Graph. 29, 4, Article 29 (July 2010), 12 pages.
[MERTENS] - Tom Mertens, Jan Kautz, and Frank Van Reeth. 2007. Exposure Fusion. In Proceedings of the 15th Pacific Conference on Computer Graphics and Applications (PG '07). IEEE Computer Society, Washington, DC, USA, 382-390.
[MITSUNAGA] - Tomio Mitsunaga, Shree K. Nayar, "Radiometric Self Calibration," Computer Vision and Pattern Recognition, IEEE Computer Society Conference on, p. 1374, 1999 IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR'99) - Volume 1, 1999.
[VELHO] - Luiz Velho. 2007. Histogram-based HDR video. In ACM SIGGRAPH 2007 posters (SIGGRAPH '07). ACM, New York, NY, USA, Article 62 .