# Literature Review 2

**Shruti Jain**
**01656195**

## Primary Paper

@article{Hasinoff:2016:BPH:2980179.2980254,
author = {Hasinoff, Samuel W. and Sharlet, Dillon and Geiss, Ryan and Adams, Andrew and Barron, Jonathan T. and Kainz, Florian and Chen, Jiawen and Levoy, Marc},
title = {Burst Photography for High Dynamic Range and Low-light Imaging on Mobile Cameras},
journal = {ACM Trans. Graph.},
issue_date = {November 2016},
volume = {35},
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year = {2016},
issn = {0730-0301},
pages = {192:1--192:12},
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url = {http://doi.acm.org/10.1145/2980179.2980254},
doi = {10.1145/2980179.2980254},
acmid = {2980254},
publisher = {ACM},
address = {New York, NY, USA},
keywords = {computational photography, high dynamic range},
}

## Secondary Paper

@inproceedings{Adams:2010:FEP:1833349.1778766,
author = {Adams, Andrew and Talvala, Eino-Ville and Park, Sung Hee and Jacobs, David E. and Ajdin, Boris and Gelfand, Natasha and Dolson, Jennifer and Vaquero, Daniel and Baek, Jongmin and Tico, Marius and Lensch, Hendrik P. A. and Matusik, Wojciech and Pulli, Kari and Horowitz, Mark and Levoy, Marc},
title = {The Frankencamera: An Experimental Platform for Computational Photography},
booktitle = {ACM SIGGRAPH 2010 Papers},
series = {SIGGRAPH '10},
year = {2010},
isbn = {978-1-4503-0210-4},
location = {Los Angeles, California},
pages = {29:1--29:12},
articleno = {29},
numpages = {12},
url = {http://doi.acm.org/10.1145/1833349.1778766},
doi = {10.1145/1833349.1778766},
acmid = {1778766},
publisher = {ACM},
address = {New York, NY, USA},
keywords = {computational photography, programmable cameras},
}
[download]

@article{Adams:2010:FEP:1778765.1778766,
 author = {Adams, Andrew and Talvala, Eino-Ville and Park, Sung Hee and Jacobs, David E. and Ajdin, Boris and Gelfand, Natasha and Dolson, Jennifer and Vaquero, Daniel and Baek, Jongmin and Tico, Marius and Lensch, Hendrik P. A. and Matusik, Wojciech and Pulli, Kari and Horowitz, Mark and Levoy, Marc},
 title = {The Frankencamera: An Experimental Platform for Computational Photography},
 journal = {ACM Trans. Graph.},
 issue_date = {July 2010},
 volume = {29},
 number = {4},
 month = jul,
 year = {2010},
 issn = {0730-0301},
 pages = {29:1--29:12},
 articleno = {29},
 numpages = {12},
 url = {http://doi.acm.org/10.1145/1778765.1778766},
 doi = {10.1145/1778765.1778766},
 acmid = {1778766},
 publisher = {ACM},
 address = {New York, NY, USA},
 keywords = {computational photography, programmable cameras},
}

## **Literature Review**

Author W.Hasinoff ,Sharlet D. , Adams A.,Chen J. along with their fellow authors in the journal , '"*Burst Photography for High Dynamic Range and Low-light Imaging*" , describes a computational photography pipeline that captures, aligns,and merges a burst of rames to reduce noise and increase dynamic range. They further claims that small sensor pixels and small apertures leads to limited dynamic range and low light. Cameras have small apertures, which limits the number of photons they can gather, leading to noisy images in low light. They also have small sensor pixels, which limits the number of electrons each pixel can store, leading to limited dynamic range.The main technical impediment to better photographs is lack of light. The proposed system by the respective authors has several key features that help make it robust and efficient. The first no use of bracketed exposures ,instead, frames of constant exposure are captured, the results in robust alignment.This exposure ,thus, is set low enough to avoid blowing out highlights. The resulting merged image had clean shadows and high bit depth, allowing to apply standard HDR tone mapping methods. In addition to this,the mosaicked RGB frames are altered with Bayer raw frames produced by hardware Image Signal Processors .This provides more bits per pixel and circumvent the ISP's unwanted tone mapping and spatial denoising. Furthermore, a novel alignment algorithm is used and a hybrid 2D/3D Wiener filter to denoise and merge the frames in a burst.

Author David E. and Ajdin, Boris and Gelfand, Natasha and Dolson, Jennifer and Vaquero, Daniel and Baek, Jongmin and Tico with the fellow authors ,in the paper, "*The Frankencamera: An Experimental Platform for Computational Photography*",proposes a fast and robust hybrid method of super-resolution and demosaicing, based on a maximum a posteriori estimation technique by minimizing a multiterm cost function. Simultaneously,the paper specifies ,designed and implemented an open architecture and API for such cameras:

the Frankencamera. Six computational photography likewise HDR viewfinding and capture, low-light viewfinding and capture, automated acquisition of extended dynamic range panoramas, foveal imaging are implemented. In addition to this, The L1 norm is used for measuring the difference between the projected estimate of the high-resolution image and each low-resolution image, removing outliers in the data and errors due to possibly inaccurate motion estimation. Bilateral regularization is used for spatially regularizing the luminance component, resulting in sharp edges and forcing interpolation along the edges and not across them.

Such methods in comparative to the primary paper standardizes the architecture and distribute Frankencameras to researchers and students, as a step towards creating a community of photographer-programmers who develop algorithms, applications, and hardware for computational cameras. Also, the architecture permits control and synchronization of the sensor and image processing pipeline at the microsecond time scale, as well as the ability to incorporate and synchronize external hardware like lenses and flashes. The primary,on the other hand ,describes a system for capturing a burst of underexposed frames, aligning and merging these frames to produce a single intermediate image of high bit depth, and tone mapping this image to produce a high-resolution photograph. The results , thus, have better image quality than single-exposure photos produced by a conventional imaging pipeline, especially in high dynamic range or low-light scenes, and almost never exhibit objectionable artifacts. Finally, an additional regularization term is used to force similar edge location and orientation in different color channels.The minimization of the total cost function is relatively easy and fast. Experimental results on synthetic and real data sets confirm the effectiveness of our method.