Enhancement of Low Dynamic Range Videos using High Dynamic Range Backgrounds

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Outline

- State-of-the-Art in HDR videos
- Our Method
- Results
- Conclusions

STAR HDRV: Computational Photography

- Modifications of LDR cameras' hardware:
  - ***Multiple cameras using a beam splitter***, Aggarwal and Ahuja [AA01]
  - ***Varying shutter speed*** in high speed camera, Kang et al. [KUWS03].
  - ***Varying exposure bayer-patter***, Narasimhan and Nayar [NN02].

STAR HDRV: HDR Sensors

- **HDRc [IC10]**: 10-12 bit in log domain. **Cons**: low resolution, noise
- **Spheron HDRv [CBB09]**: 20 f-stops, 1080p, 30fps. **Cons**: bulky system, and unknown price.
- **Red HDRx© [RED10]**: 18 f-stops, 5K, 48fps. **Cons**: expensive (~$12K or more?)

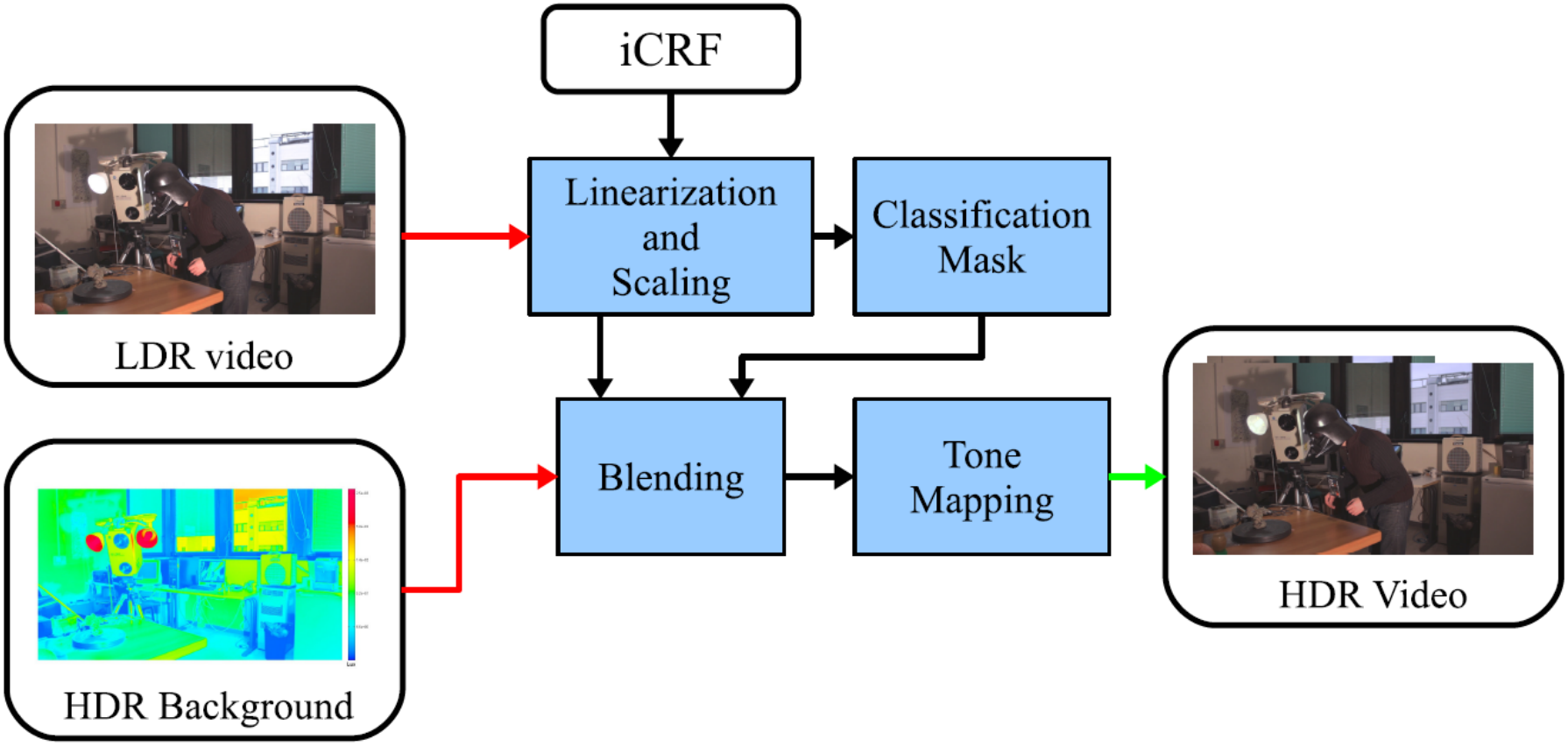
STAR: Post Processing Techniques

- Post processing to the videos with extra information:
  - Spatial-Temporal alignment of multiple exposure videos, Sand and Teller [ST04].
  - SfM scene reconstruction plus projection of HDR images of the same scene, Bhat et al. [BZS07].

Our Method

	Scene Static	**Scene Dynamic**
Camera Static	Standard HDR Photography	**Our Method**
Camera Dynamic	Post-Processing Techniques	Computational Photography or HDR Sensors

Our Method: Framework



Linearization and Scaling

- **Goal**: Matching intensities and colors with the HDR background:
  - LDR video is linearized using the inverse CRF
  - LDR video: scaled by the shutter speed

Pixels Classification

Original LDR Frame

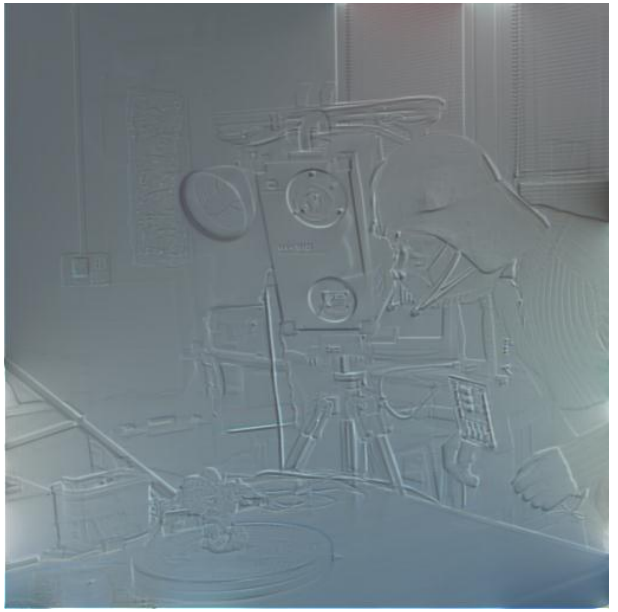
Blending

- Blending:
  - Linear interpolation of the HDR background and LDR video using the classification map as weights
- Better methods but more expensive?
  - Wavelets
  - Laplacian Pyramids
  - Gradient Domain

Blending: Comparisons

Gradient Domain

Linear Interpolation



Difference

Results

- See videos

Conclusions

- Advantages:
  - Low cost HDR videos
  - The same dynamic range of the scene
  - High Resolution videos
- Disadvantages:
  - Fixed camera
  - Diffuse Objects or limited specularity

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