# High Quality Image Reconstruction from RAW and JPEG Image Pair

ICCV 2011 submission

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# Example 1: Evaluation in Synthetic Case

1. Image Capture Mode: full-res RAW + full-res JPEG

2. Input Images: sRAW$(1/4\times)^*$ + full-res JPEG

   Note: we downsample the full-res RAW to sRAW$(1/4\times)$, which has 1/4 of the image side in the full-res RAW. In this case, we adjust highlights and white-balance in the JPEG image. Some quantization artifacts are amplified in highlight sky regions.

3. Calculate PSNR for results by different methods

# Input sRAW(1/4×)(red) and full-res JPEG image pair

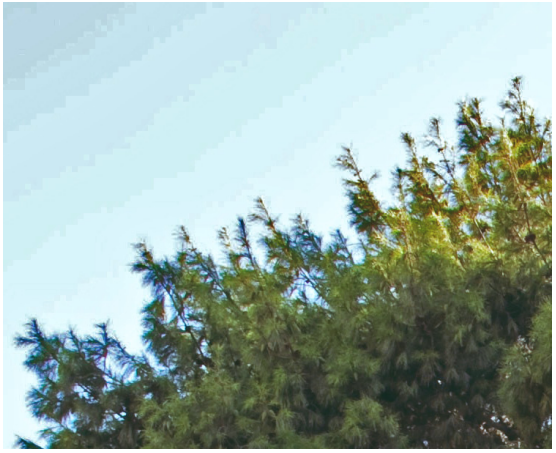
# Result by global tone-mapping

# Result by our approach

# Ground Truth

# Close-up comparisons

bicubic
PSNR = 26.8 dB



global tone-mapping
PSNR = 24.8 dB

our approach
PSNR = 41.4 dB

joint-bilateral upsampling
($\sigma_d$ = 0.5, $\sigma_s$ = 0.07)
PSNR = 27.8 dB

joint-bilateral upsampling
($\sigma_d$ = 1.0, $\sigma_s$ = 0.2)
PSNR = 25.9 dB

ground truth

# Example 2: Comparison in Real Case

1. Image Capture Mode: sRAW($1/2\times$) + full-res JPEG

2. Input Images: sRAW($1/4\times$)$^*$ + full-res JPEG

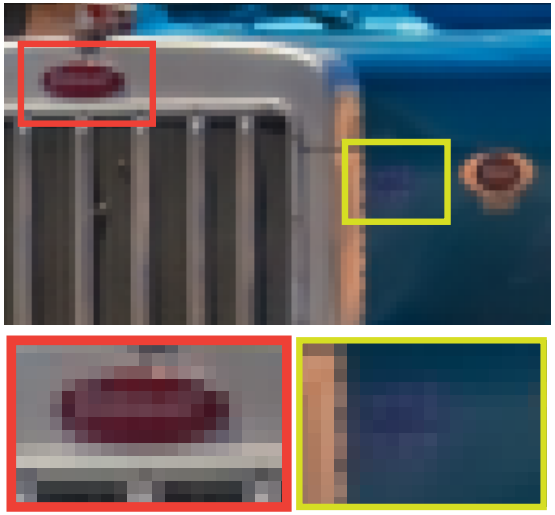
   Note: we downsample the sRAW($1/2\times$) to sRAW($1/4\times$), which has 1/2 of the image side in the sRAW($1/2\times$) or has 1/2 of the image side in the full-res RAW.

# Input sRAW($1/4\times$)(red) and full-res JPEG image pair

# Result by global tone-mapping

# Result by our approach

# Close-up comparisons with other methods

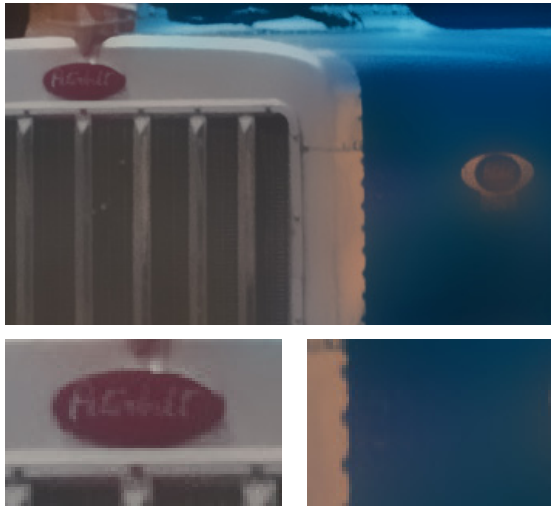


nearest neighboring (X4)

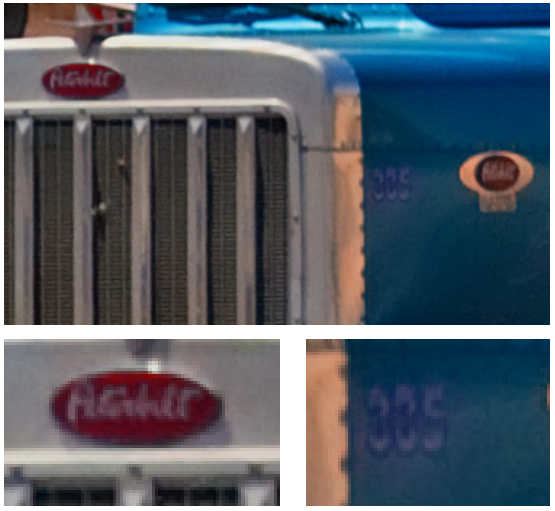
bicubic (X4)

edge-profile based method

joint-bilateral upsampling
($\sigma_d$ = 0.5, $\sigma_s$ = 0.07)

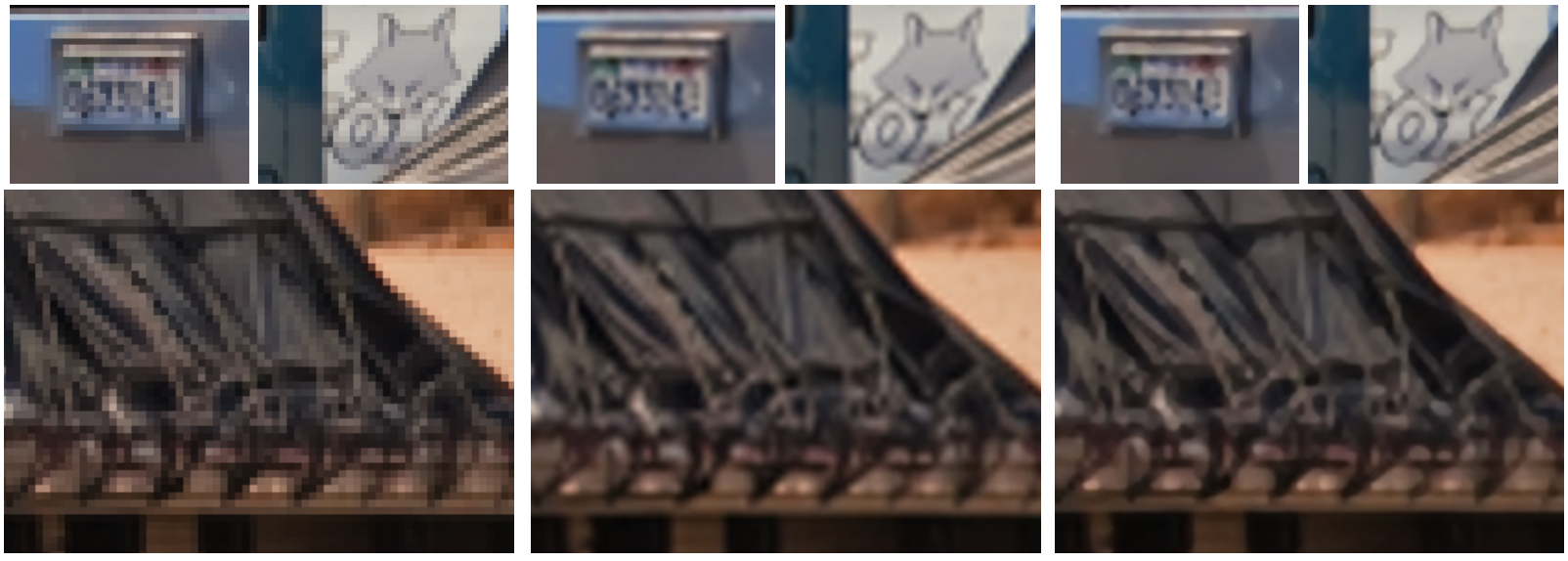


joint-bilateral upsampling
($\sigma_d$ = 1.0, $\sigma_s$ = 0.2)

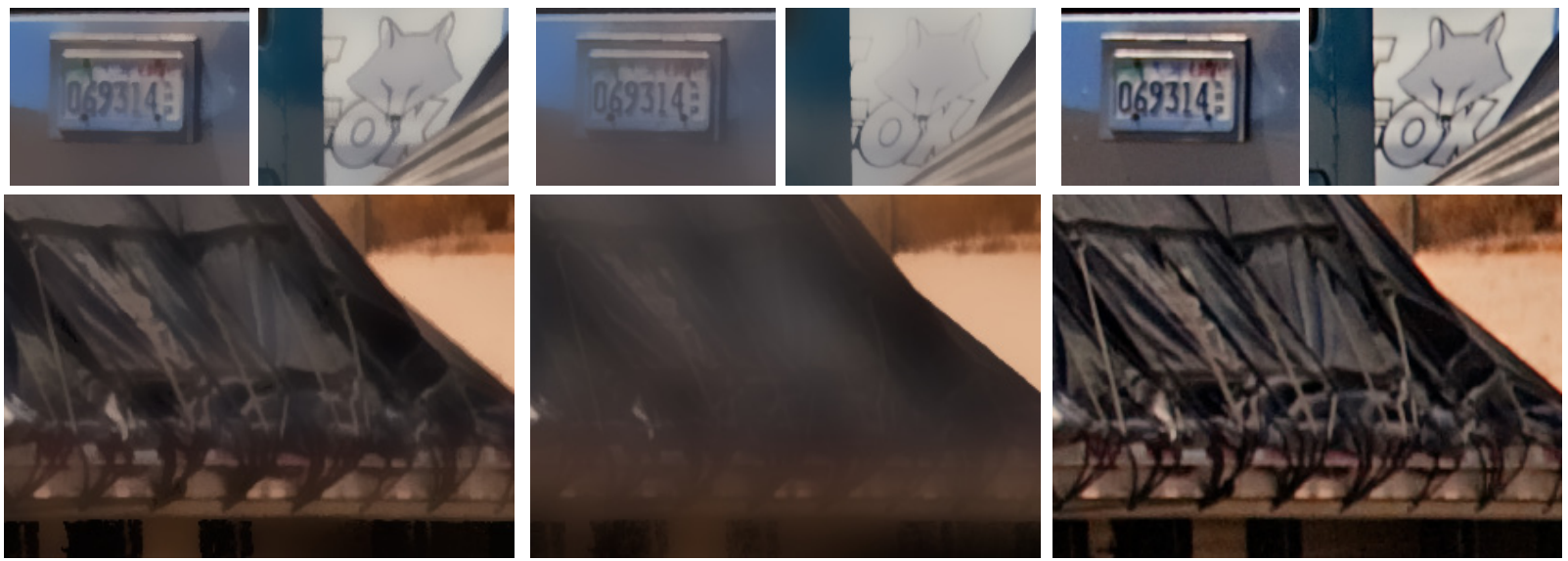


our approach

# Close-up comparisons with other methods



nearest neighboring (X4) | bicubic (X4) | edge-profile based method



joint-bilateral upsampling ($\sigma_d$ = 0.5, $\sigma_s$ = 0.07) | joint-bilateral upsampling ($\sigma_d$ = 1.0, $\sigma_s$ = 0.2) | our approach

# Example 3: Application in Monochrome Style

1. Image Capture Mode: sRAW($1/2\times$) + full-res JPEG, Monochrome Picture Style

   Note: In this style, the acquired JPEG is Monochrome color, however, the sRAW still maintains all color information. The setting of Monochrome style is saved in the head of RAW file.

2. Input Images: sRAW($1/8\times$)$^*$ + full-res JPEG

   Note: we downsample the sRAW($1/2\times$) to sRAW($1/8\times$), which has 1/4 of the image side in the sRAW($1/2\times$) or has 1/4 of the image side in the full-res RAW.

3. Total File Size of sRAW+JPEG (Percentage of Original RAW):

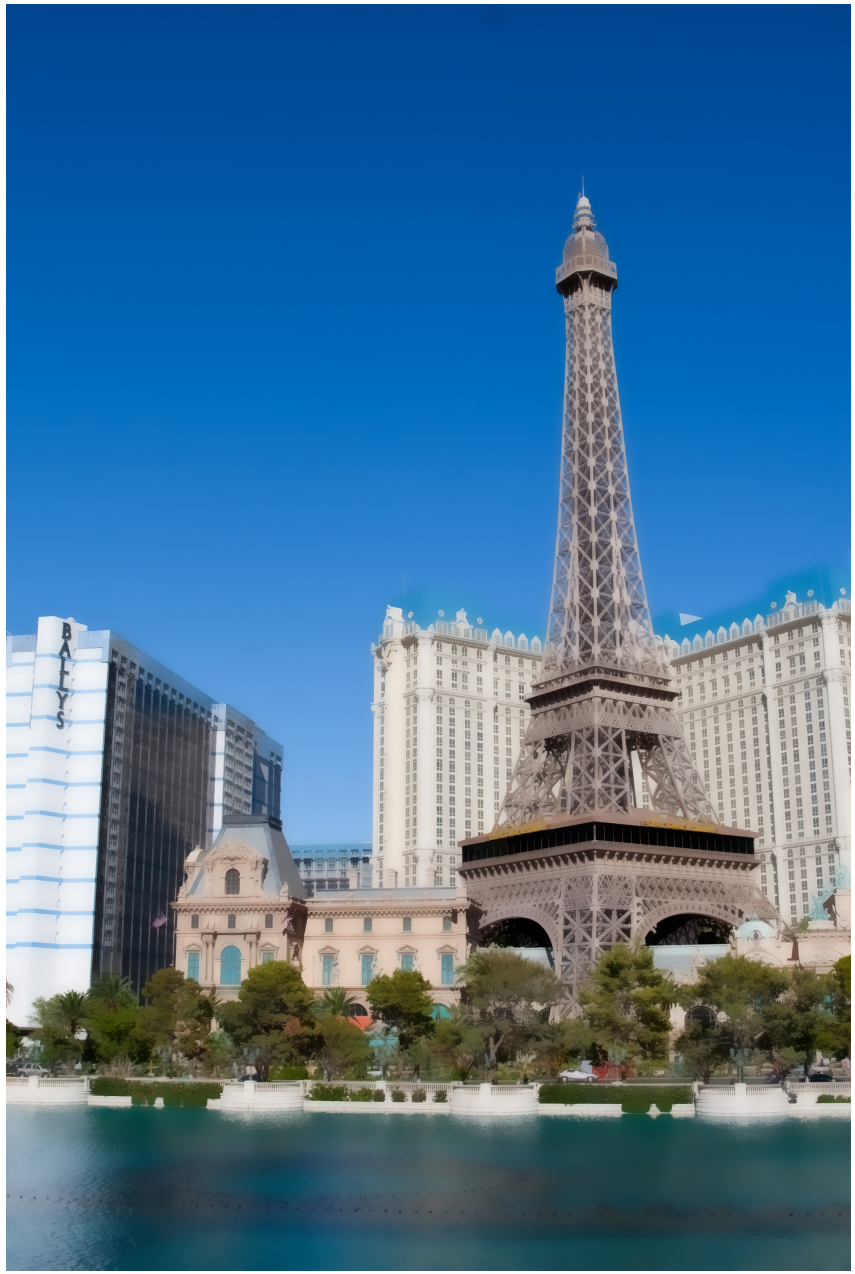
   17.3%(8% + 9.3%) for flat images

   28.4%(12% + 16.4%) for textured images

# Input sRAW(1/8×)(red) and full-res JPEG image pair

# Result by global tone-mapping

# Result by joint-bilateral upsampling ($\sigma_d = 0.5, \sigma_s = 0.1$)



# Result by our approach

# Input sRAW(1/8×)(red) and full-res JPEG image pair

# Result by global tone-mapping

# Result by joint-bilateral upsampling ($\sigma_d = 0.5, \sigma_s = 0.1$)

# Result by our approach

Thank you!