Adaptive Feature Consolidation Network for Burst Super-Resolution

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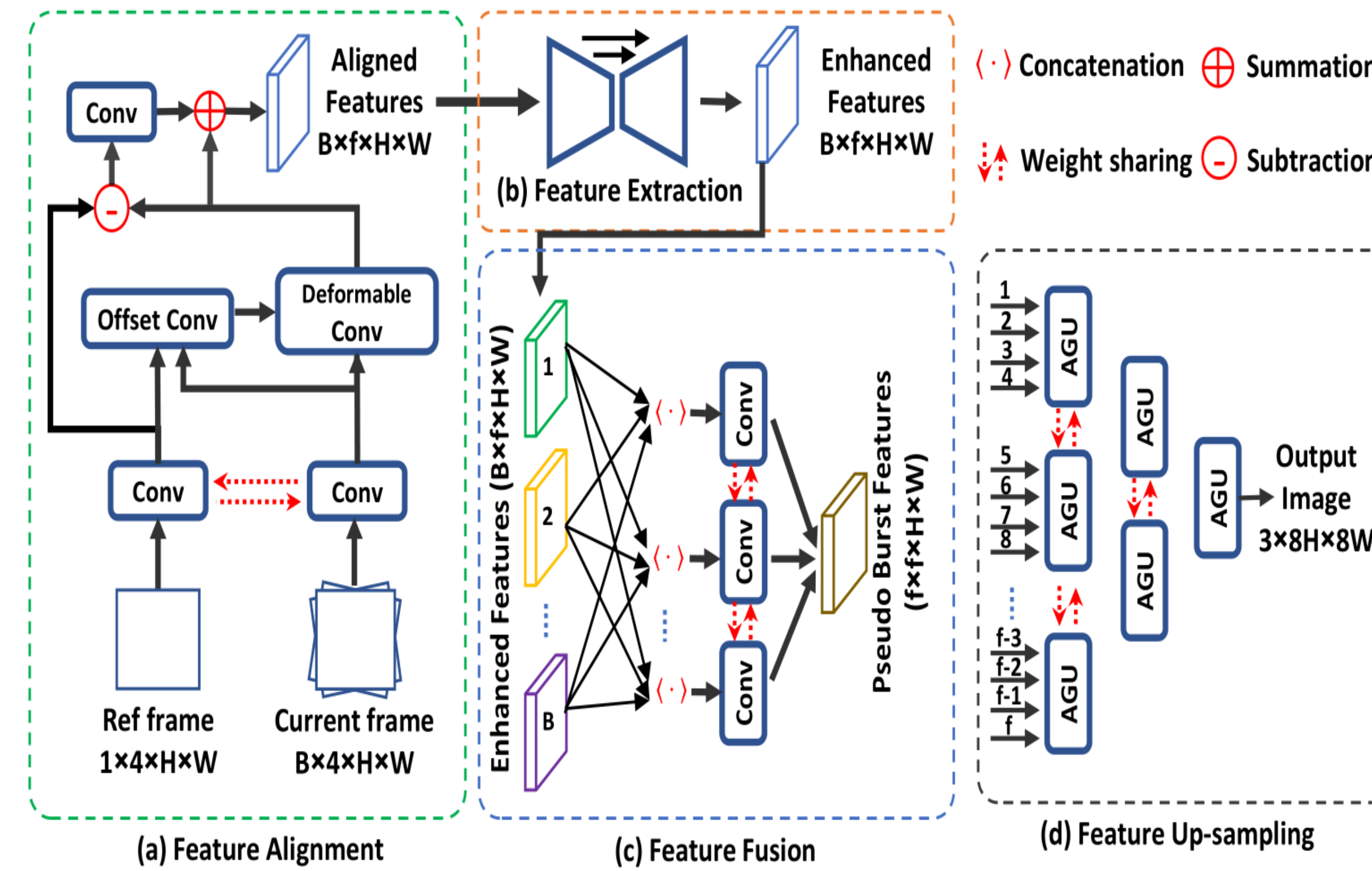CVPR JUNE 19-24 2022 NEW ORLEANS · LOUISIANA

Overview:

➤ In comparison to DSLR cameras, low-quality images are generally outputted in portable mobile devices on account of their physical limitations.

➤ The synthesized low-quality images usually have multiple degradations - low-resolution owing to small camera sensors, mosaic patterns on account of camera filter array, subpixel shifts due to camera motion.

➤ Such degradation usually restrain the performance of single image super-resolution methodologies for retrieving high-resolution image from a single LR image.

➤ Burst image super-resolution aims at restoring a photorealistic HR image by capturing abundant information from multiple images.
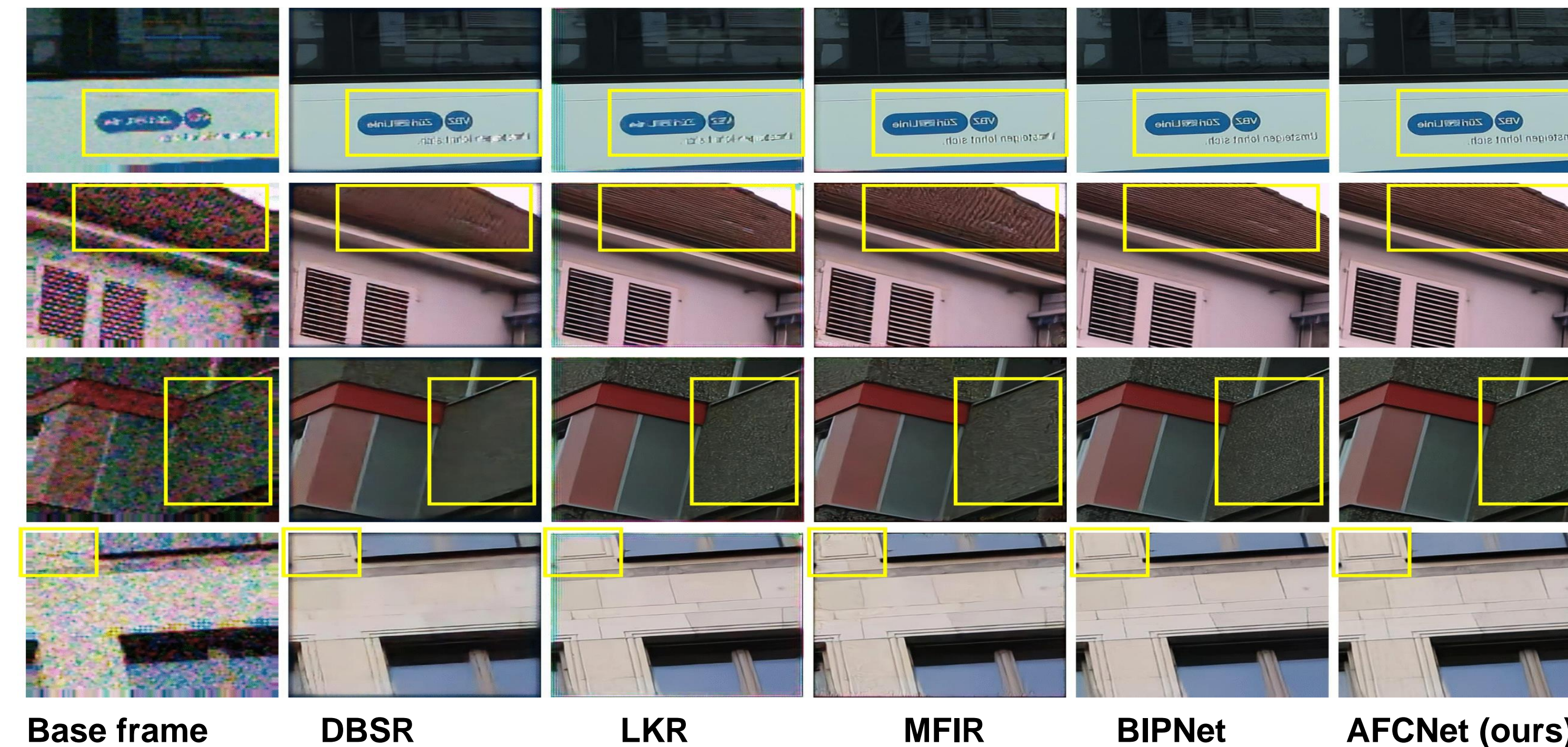
Proposed Solution:

➤ Our framework efficiently merges the image contents among the multiple burst LR frames in a coherent and effective way, generating HR outputs with realistic textures and high-frequency details.

➤ We propose a simple but effective feature alignment module to align the burst image features with the base frame.

➤ We utilise encoder-decoder based transformer backbone for feature extraction to enrich the aligned feature representations.

➤ An efficient abridged pseudo burst fusion module is utilized to aid inter-frame information exchange and feature consolidation.

➤ Adaptive group up-sampling is performed for progressive fusion and up-scaling of the burst features.

Architecture:

(a) Feature Alignment   (b) Feature Extraction   (c) Feature Fusion   (d) Feature Up-sampling

Qualitative Results:

Base frame   DBSR   LKR   MFIR   BIPNet   AFCNet (ours)

Quantitative Results:

Methods	SyntheticBurst		(Real)BurstSR	
	PSNR	SSIM	PSNR	SSIM
Single Image	36.17	0.91	46.29	0.982
HighRes-net[10]	37.45	0.92	46.64	0.980
DBSR [5]	40.76	0.96	48.05	0.984
LKR [19]	41.45	0.95	-	-
MFIR [7]	41.56	0.96	48.33	0.985
BIPNet [12]	41.93	0.96	48.49	0.985
AFCNet (Ours)	**42.21**	**0.96**	**48.63**	**0.986**

Ablation Study:

Methods	A1	A2	A3	A4	A5	A6
Basline	✓	✓	✓	✓	✓	✓
Alignment		✓	✓	✓	✓	✓
Back-prop			✓	✓	✓	✓
EDTB				✓	✓	✓
APBF					✓	✓
AGU						✓
PSNR	36.38	39.92	39.50	41.20	41.80	42.21

References:

➤ Bhat, Goutam, et al. "Deep burst super-resolution." *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition.* 2021.

Paper: