



Learning Spatial-Temporal Implicit Neural Representations for Event-Guided Video Super-Resolution



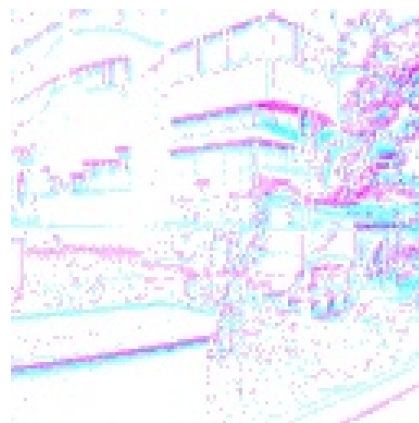
Students: Yunfan Lu*, Zipeng Wang*, Minjie Liu, Hongjian Wang
Lin WANG, Ph.D., Assistant Professor (linwang@ust.hk)
Visual Learning and Intelligent Systems Lab (VLIS LAB)
Thrust of Artificial Intelligence, Information Hub, GZ Campus
Department of Computer Science and Engineering, CWB Campus
The Hong Kong University of Science and Technology (HKUST)

Event-Guided Video SR

Context

- High dynamic range and low latency

Sensor	Dynamic Range (dB)	Equivalent Frame Rate* (fps)
Human eye	30–40	200-300
High-end DSLR camera	44.6	120
Event camera	120	10,000



Intensity image and event data visualization

Event-Guided Video SR

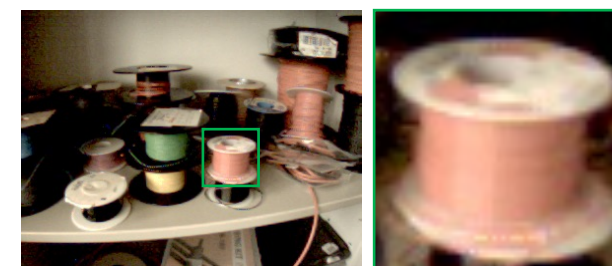
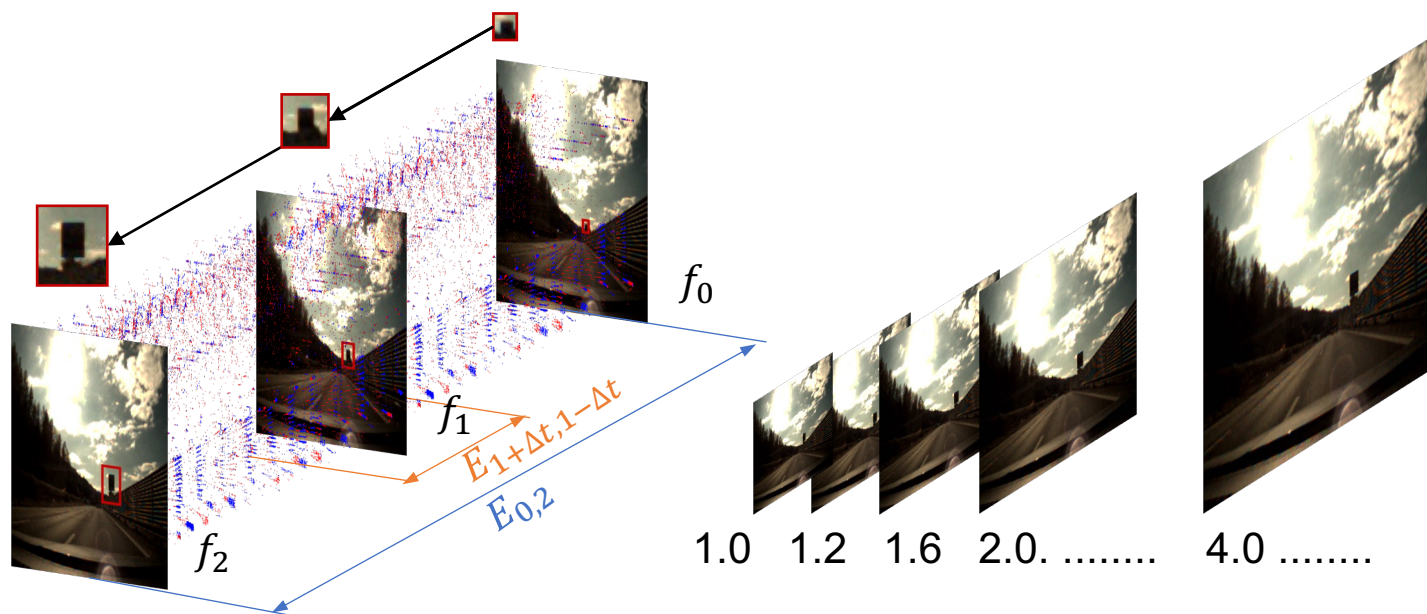
Research Question

How to achieve VSR at random scales by taking advantages of the high temporal resolution property of events?

Event-Guided Video SR

Challenges

- Space-temporal dependency
- Random scale SR
- Low-resolution and noise-affected dataset

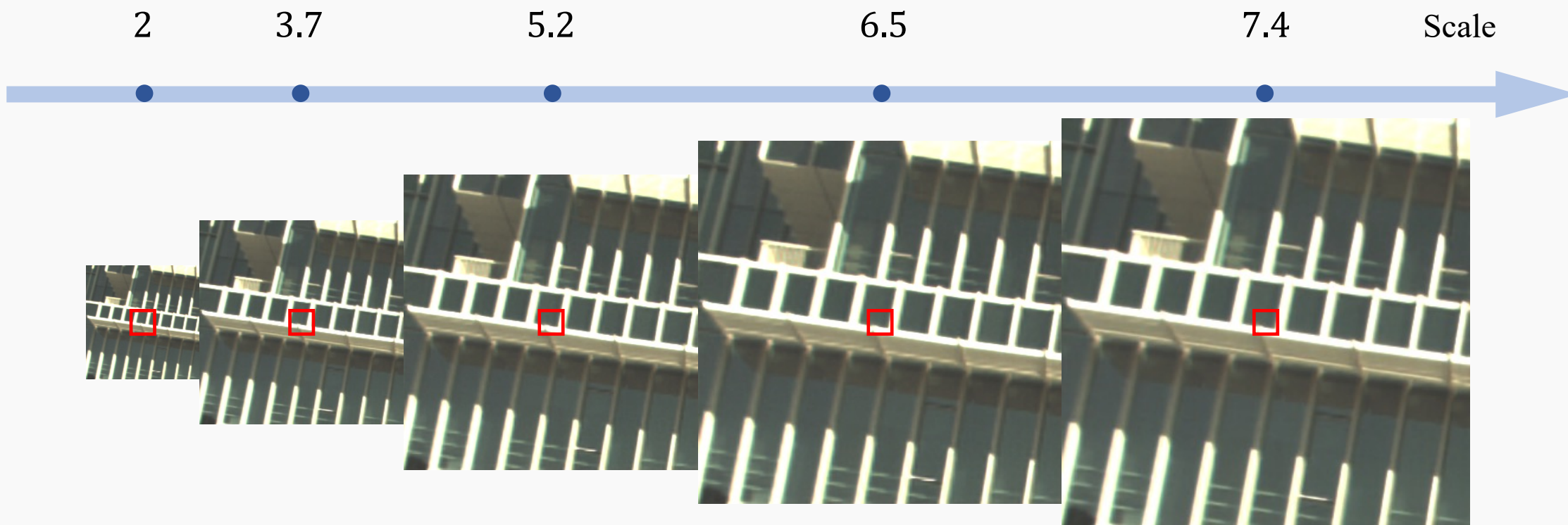


346x260

noise

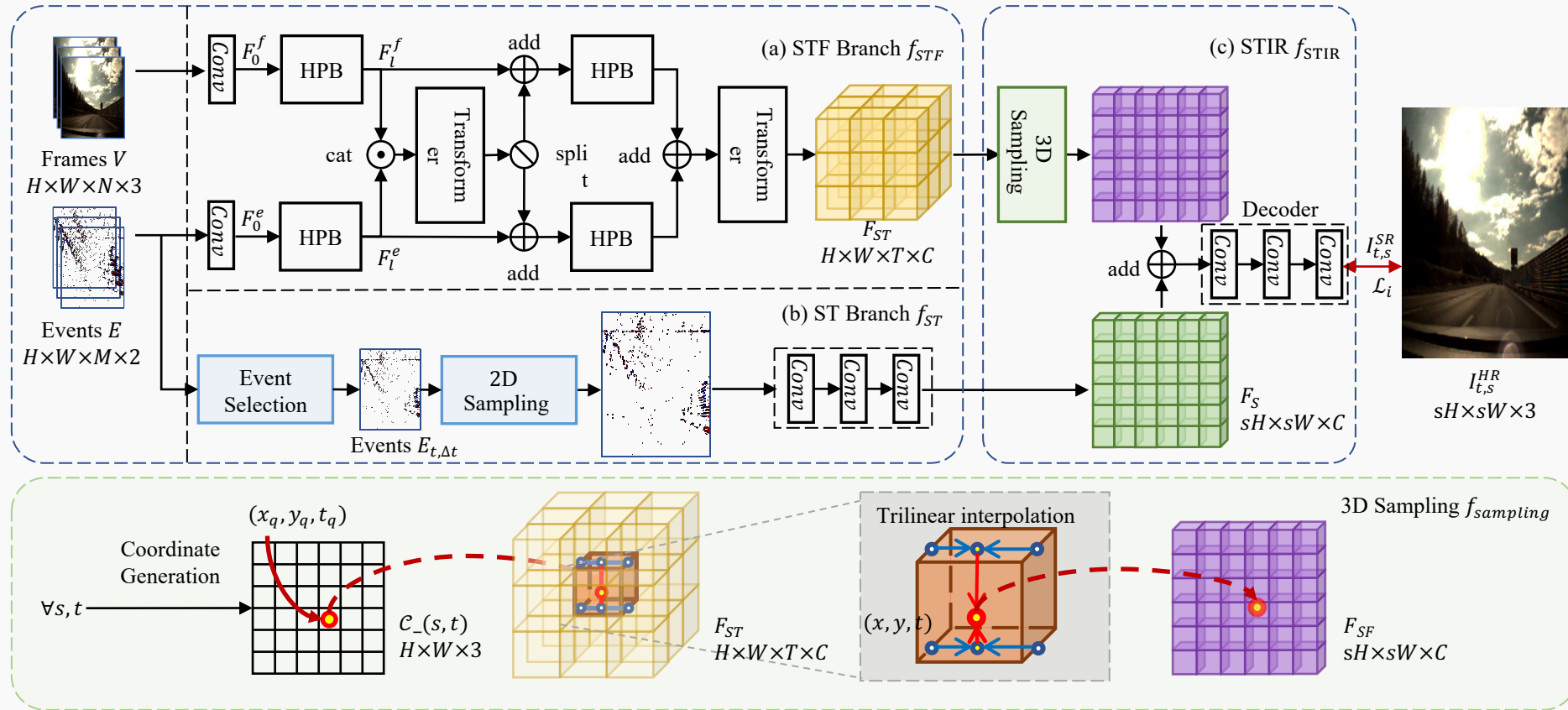
Event-Guided Video SR

VSR at Random Scales



Event-Guided Video SR

Proposed Methods



Event-guided video super-resolution framework

Event-Guided Image SR Transformer

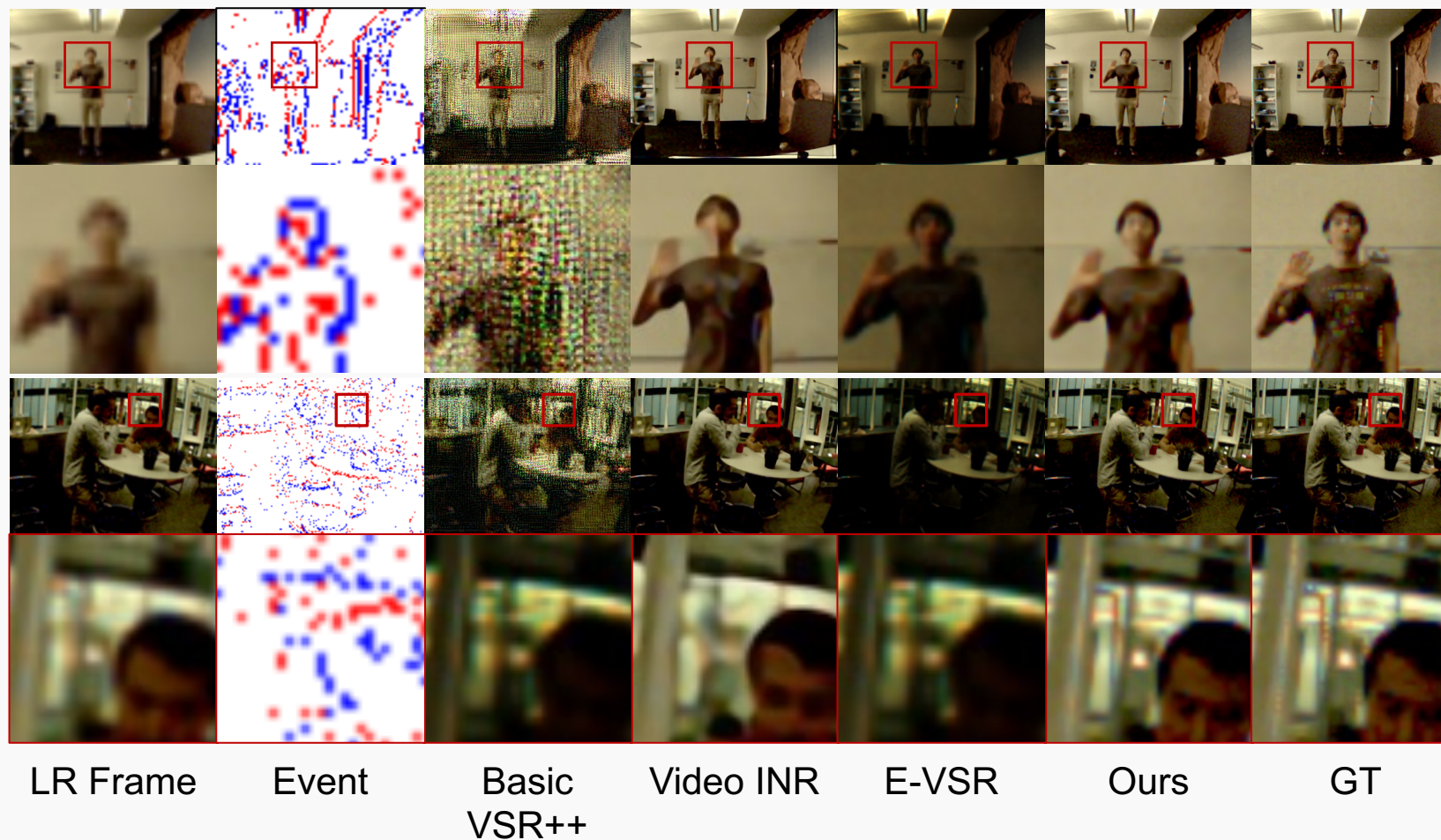
Experiments

Method	PSNR	SSIM	Model Size
DUF	24.43	0.8177	1.90
TDAN	27.88	0.8231	1.97
SOF	27.00	0.8050	1.00
RBPN	29.80	0.8975	12.18
BasicVSR++	14,76	0.1641	7.30
Video INR	25.52	0.7871	11.31
E-VSR	30.14	0.9052	412.42
Ours-v1	31.12	0.9211	2.45

Quantitative results on CED dataset for $\times 4$.

Event-Guided Image SR Transformer

Experiments



Visual results of $\times 4$ VSR on the CED dataset.

Event-Guided Image SR Transformer

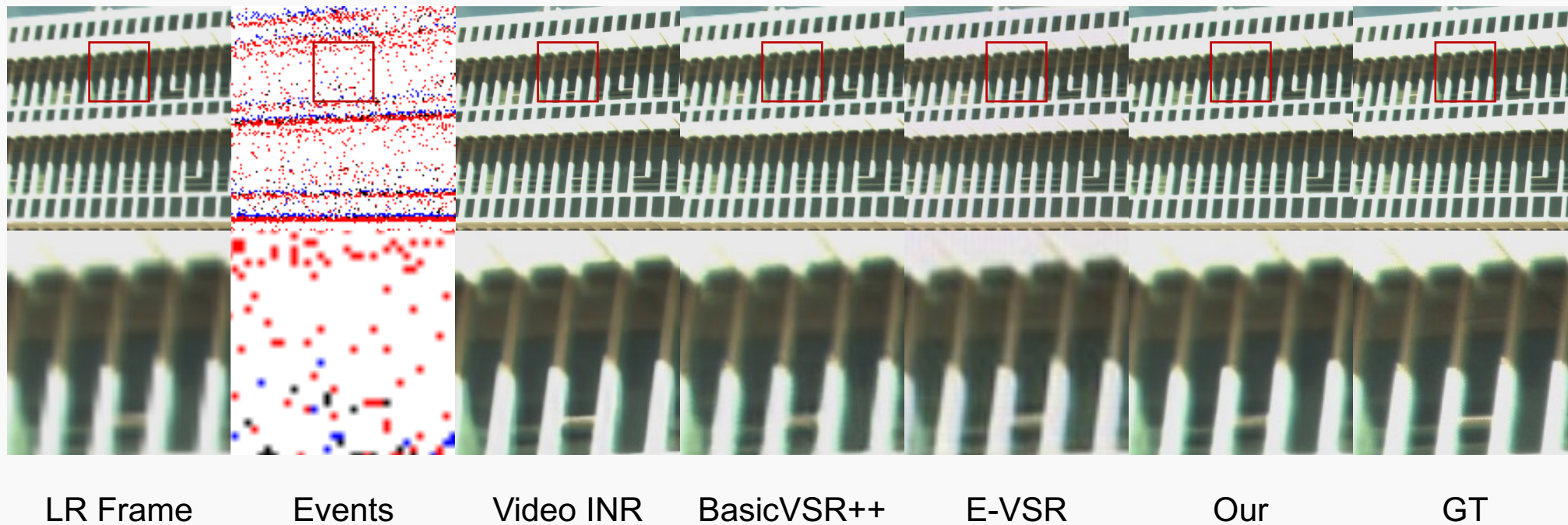
Experiments

Scale	Method	PSNR	SSIM
2x	E-VSR	36.10	0.9761
	Ours	38.25	0.9822
4x	E-VSR	32.54	0.9163
	BasicVSR++	35.30	0.9353
	Ours	37.12	0.9353
6x	Video INR	31.15	0.9084
	Ours	31.85	0.9267
8x	Video INR	28.11	0.8625
	Ours	28.53	0.8901

Quantitative comparison (PSNR/SSIM) of our methods and other methods on the ALPIX-VSR dataset.

Event-Guided Image SR Transformer

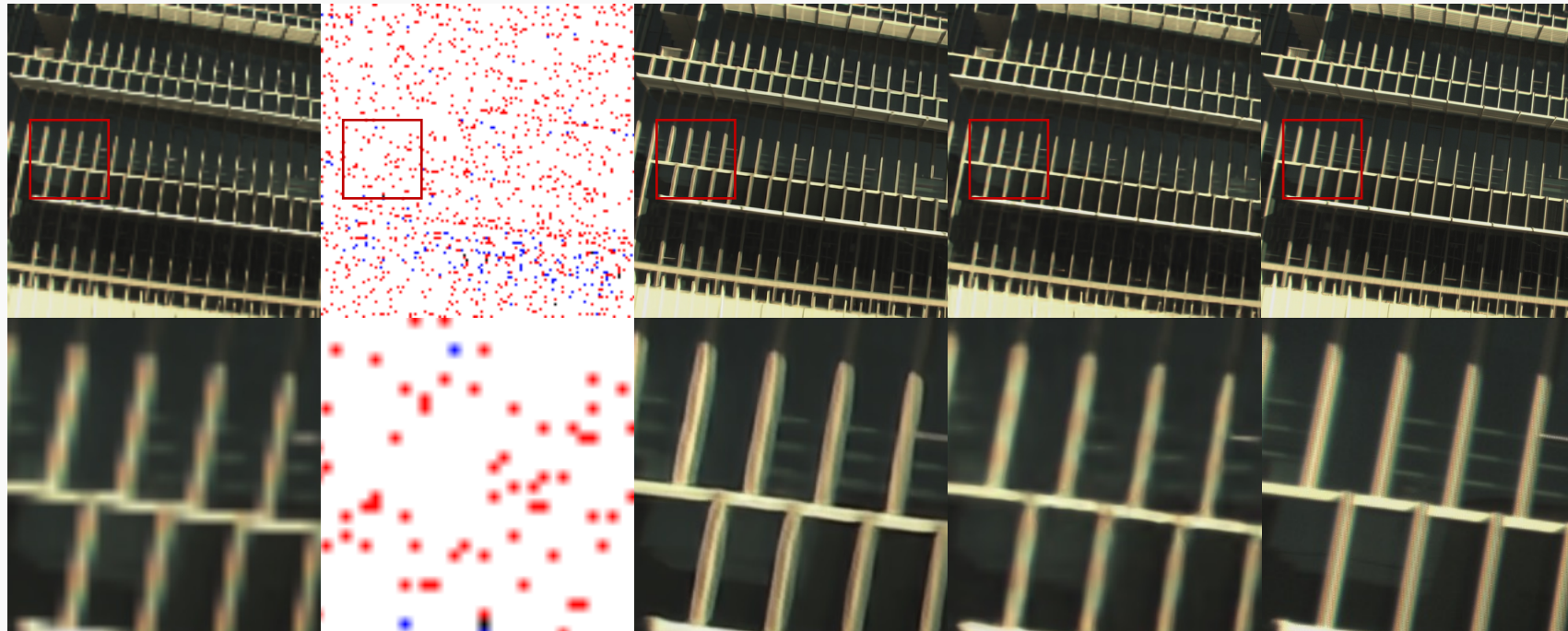
Experiments



Visual results of $\times 4$ VSR on the APLEX-VSR dataset.

Event-Guided Image SR Transformer

Experiments



LR Frames

Events

VideoINR

Ours

GT

Visual results of $\times 8$ VSR on the APLEX-VSR dataset.

Event-Guided Image SR Transformer

Experiments

x1.8	x2.6	x5.6
39.2508	37.3408	31.2549
0.9803	0.9589	0.9135
x6.6	x7.1	x7.8
28.3182	28.3188	28.3198
0.8772	0.87762	0.8783

Quantitative results(PSNR/SSIM) of random-scale comparison on the ALPIX-VSR

Event-Guided Image SR Transformer

Experiments



(a) Basic VSR++

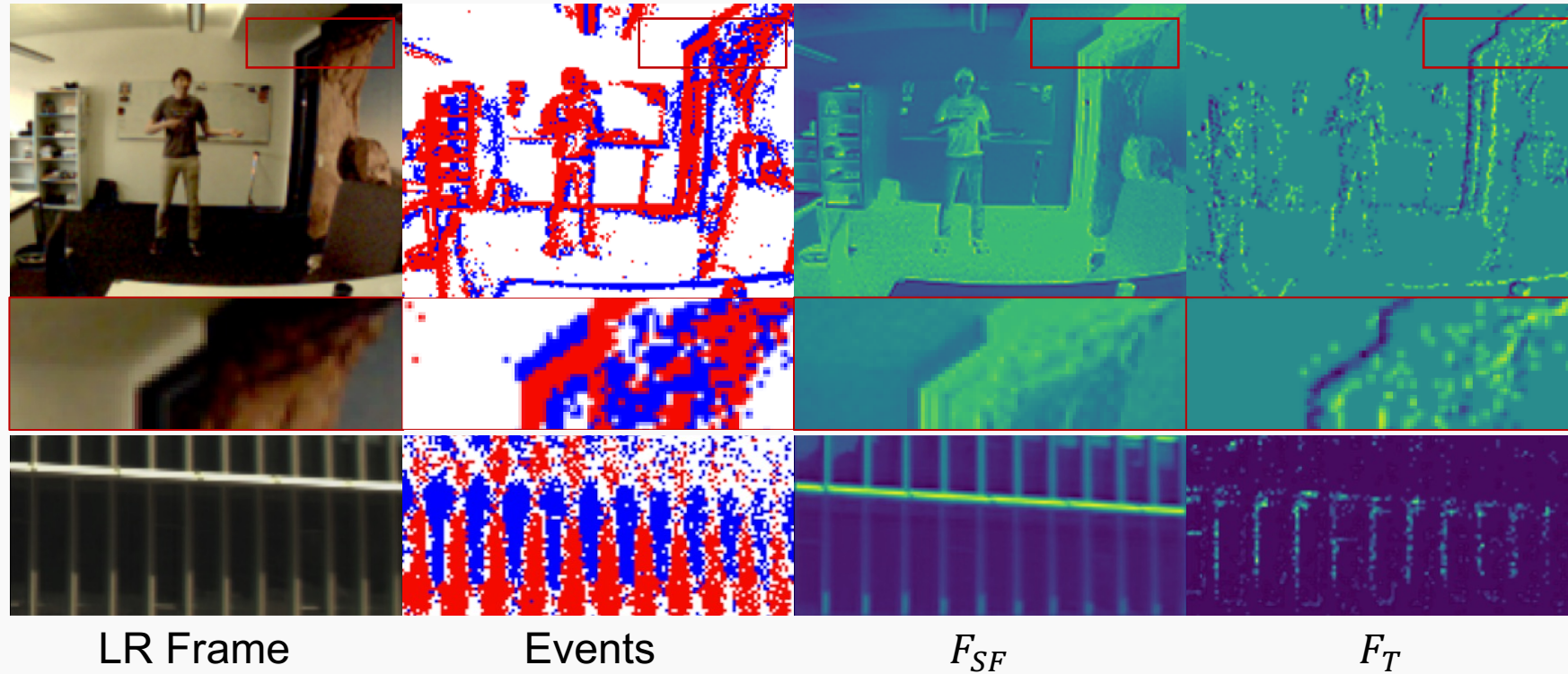
(b) Our

(c) GT

Comparison of noise removal capacity of BasicVSR++

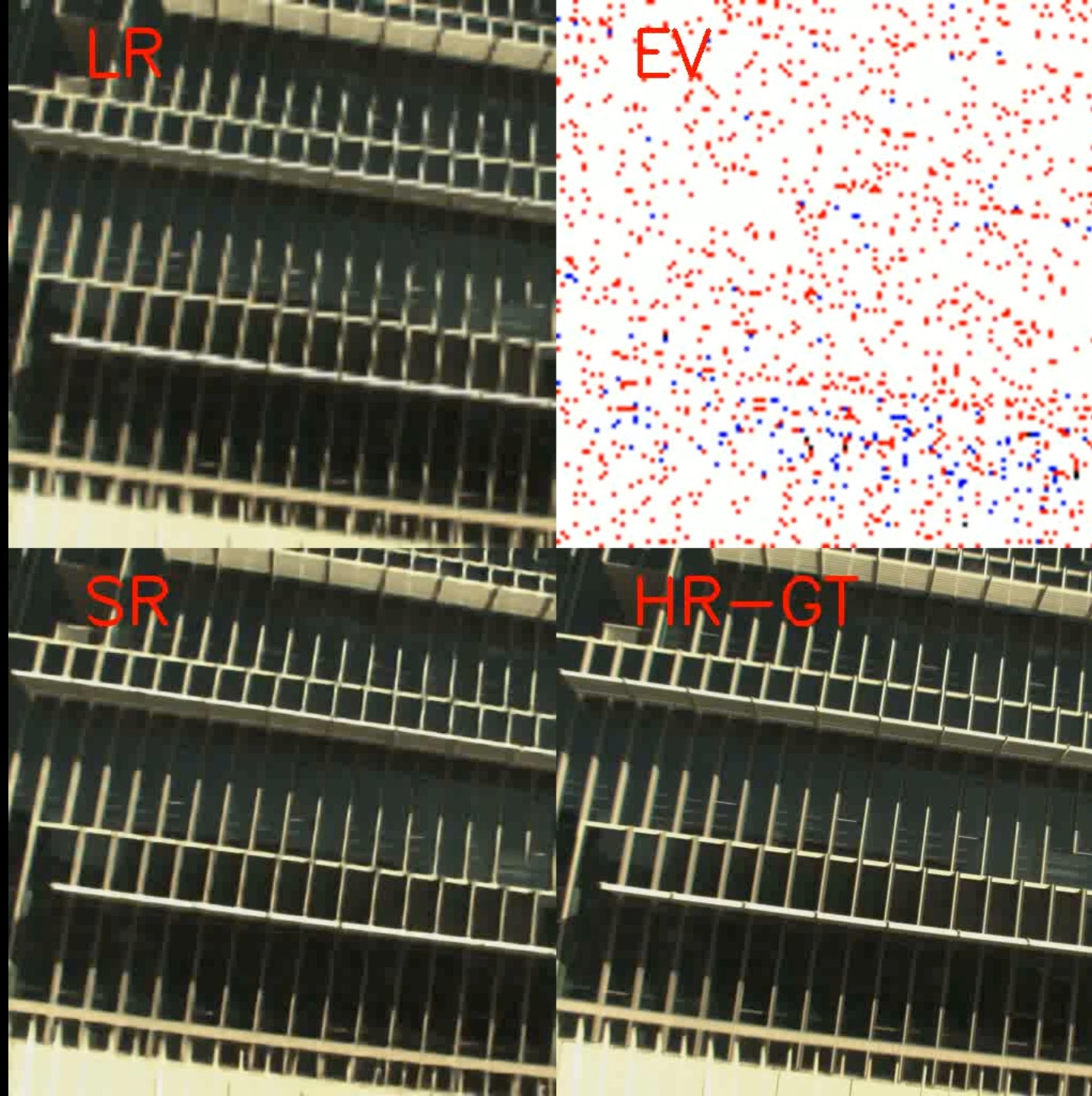
Event-Guided Image SR Transformer

Experiments

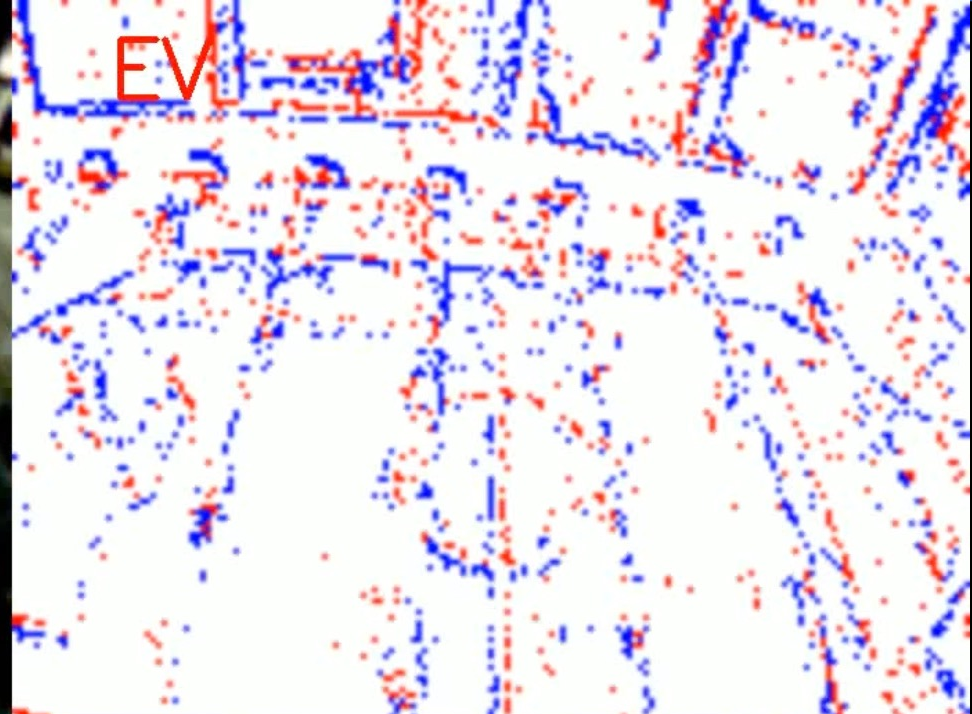
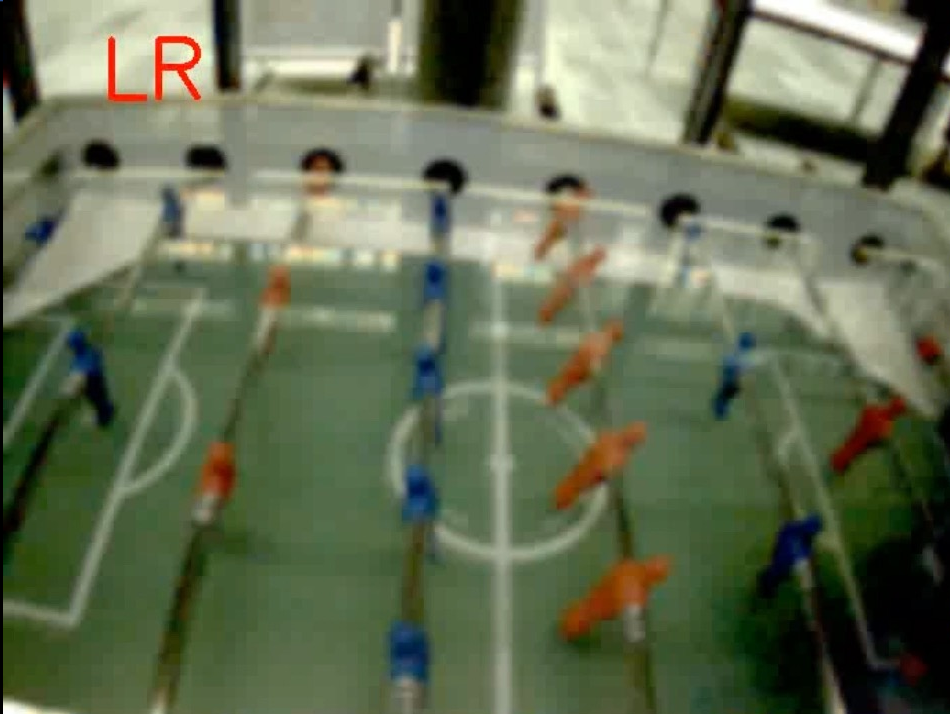


Feature visualization

APLIX-VSR



CED



Thanks