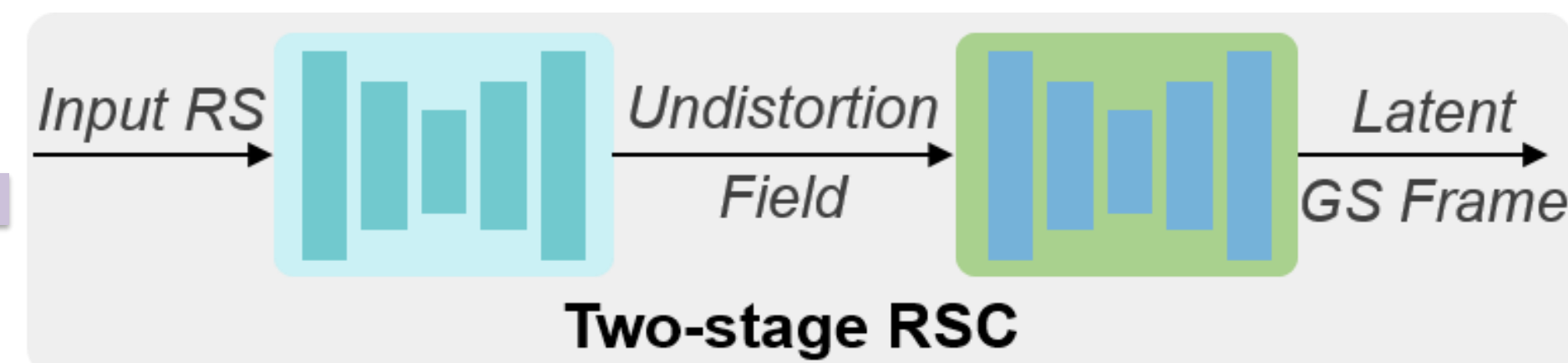


Motivation

Existing rolling shutter correction (RSC) methods employ a **two-stage** network design:

- **Motion Estimation Module:** Estimating a pixel-wise undistortion field to warp the RS appearance content to the corresponding global shutter (GS) instance.
- **GS Frame Synthesis Module:** Fusing the contextual information in a coarse-to-fine manner, ultimately decoding the desired GS image.



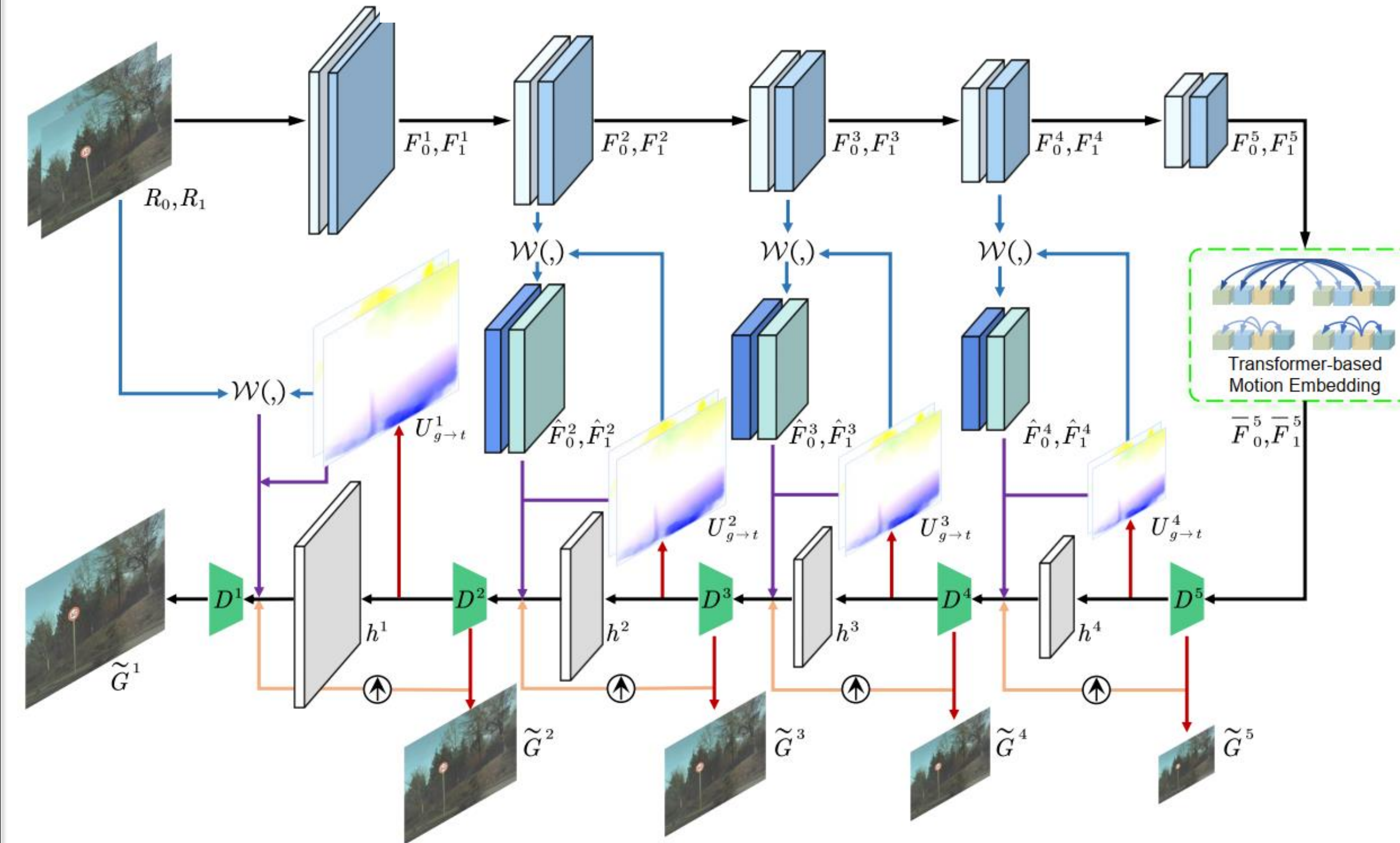
- **“Chicken-and-Egg” Problem:** Ignoring the mutual promotion of these two key modules is not conducive to joint optimization.
- **Inefficient Actual Deployment:** Two-stage methods inevitably increase the model size and inference time.



Our single-stage method: Joint motion estimation and GS frame synthesis

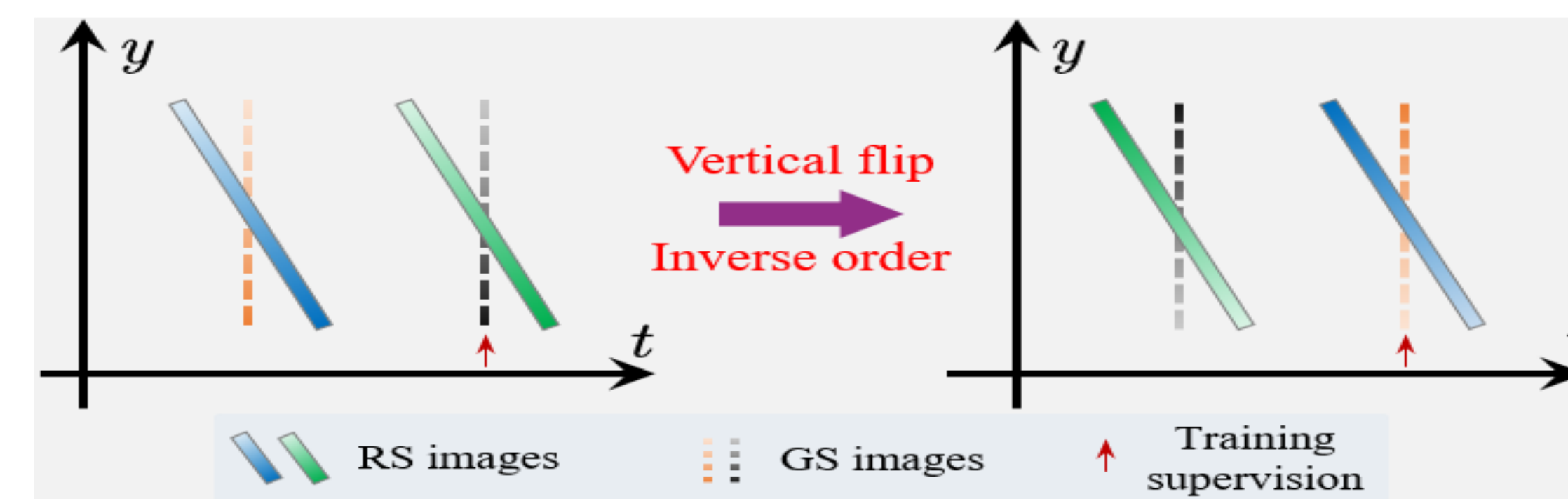
- Real-time
- Light-weight
- High-accuracy

Network Framework



- ✓ **Feature pyramid encoder**
- ✓ **Transformer-based motion embedding module**
- ✓ **Joint appearance and motion decoder:** Two synchronized branches, i.e., warping-based and synthesis-based, are designed to focus on context aggregation and occlusion reasoning

Data Augmentation



- ✓ A novel data augmentation strategy: **Vertical Flip & Inverse Order** is proposed to release the potential of the RSC datasets.

Experimental Results

Performance on Carla-RS and Fastec-RS datasets

Method	Runtime (ms)	PSNR↑ (dB)			SSIM↑		LPIPS↓	
		CRM	CR	FR	CR	FR	CR	FR
SUNet [10] + BMBC [35]	938	28.51	28.69	25.49	0.848	0.796	0.1033	0.2118
SUNet [10] + DAIN [4]	227	28.63	28.93	27.12	0.851	0.823	0.0919	0.1642
DiffSfM [58]	$4.7e^5$	25.93	22.88	21.44	0.770	0.710	0.1201	0.2180
AdaRSC [5]	302	-	-	28.56	-	0.855	-	0.0796
JCD [56]	225	28.12	27.75	26.48	0.836	0.821	0.0595	0.0943
SUNet [10]	92	28.44	28.17	27.06	0.838	0.825	0.0702	0.1030
DeepUnrollNet [29]	131	27.86	27.54	26.73	0.829	0.819	0.0555	0.0995
JAMNet (Ours)	28	31.00	30.70	28.70	0.905	0.865	0.0371	0.0691

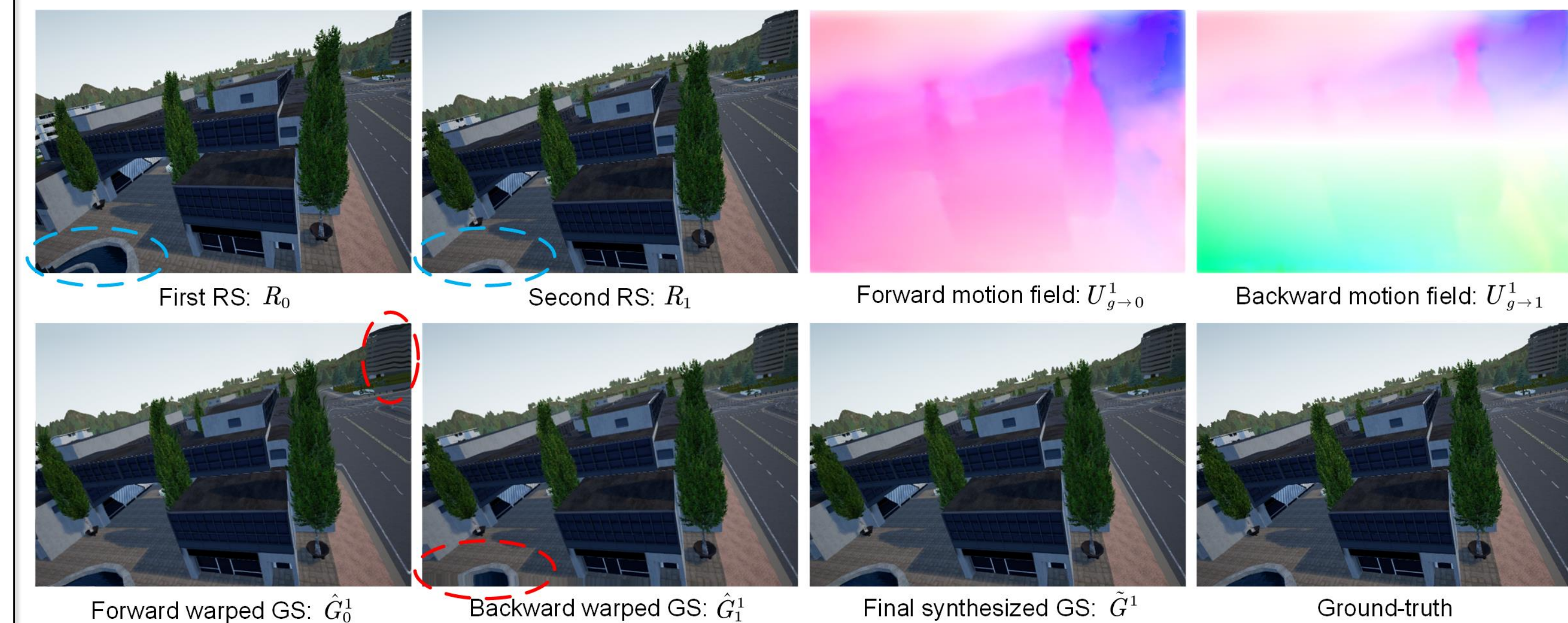
Real-time

Performance on BS-RSC dataset

RSC Method	PSNR↑ (dB)	SSIM↑
DiffSfM [58]	19.80	0.698
DeepUnrollNet [29]	25.21	0.833
SUNet [10]	27.76	0.875
JCD [56]	25.59	0.841
AdaRSC [5]	28.23	0.882
JAMNet (Ours)	32.93	0.941



Intermediate process of undistortion field estimation and occlusion reasoning



Qualitative rolling shutter correction result

