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RNNSC: Recurrent Neural Network-Based Stereo Compression Using Image and State Warping

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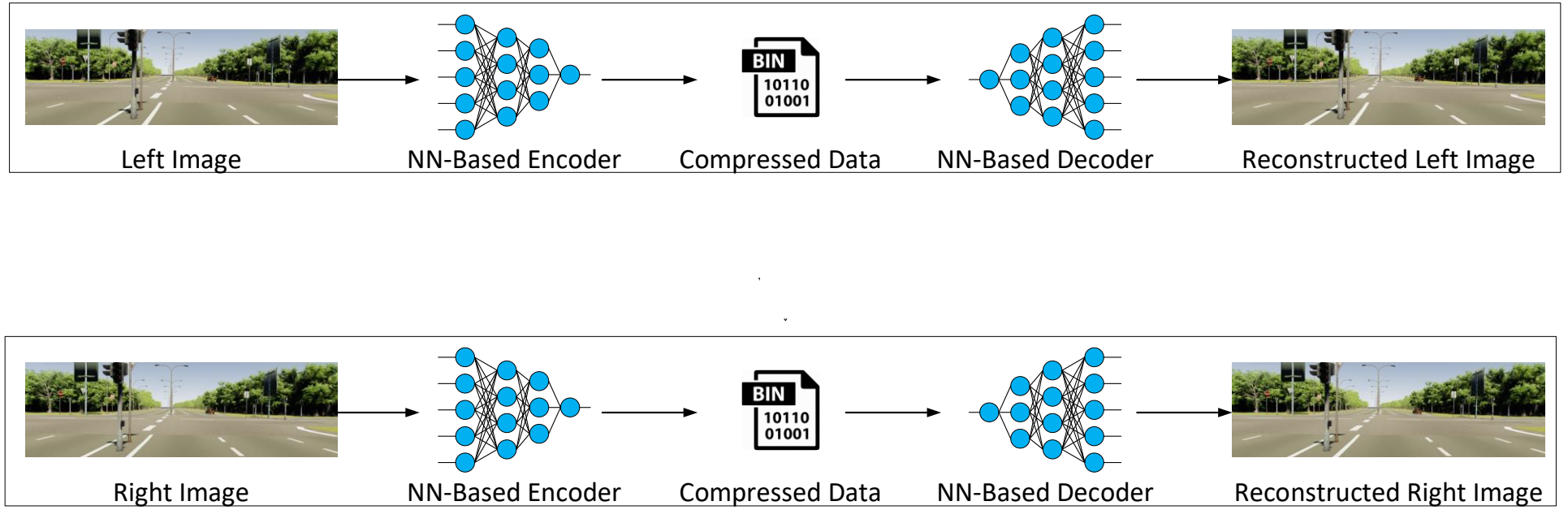
realVision

Introduction

Neural Network-Based Single Image Compression

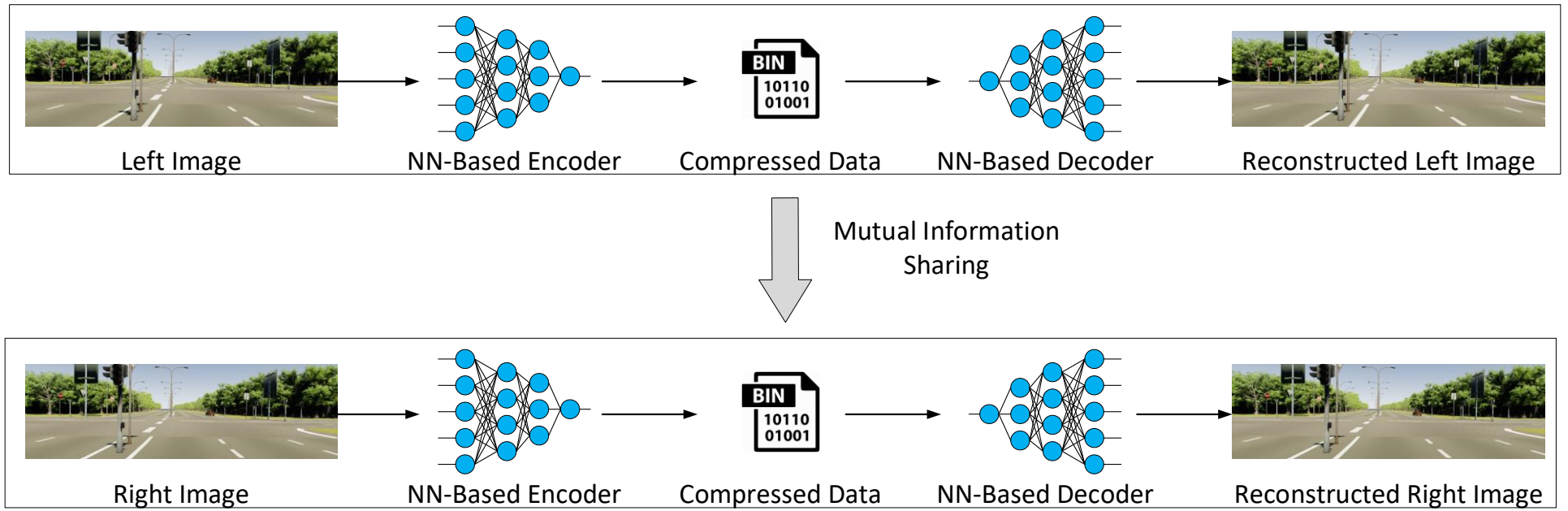
- **Stereo image pair consists of overlapping regions visible to both cameras**
- **Current neural network-based single-image compression methods cannot be directly used for stereo images**
- **Individual compression of each stereo image does not benefit from the already compressed information**



Proposed Method

State and Image Sharing

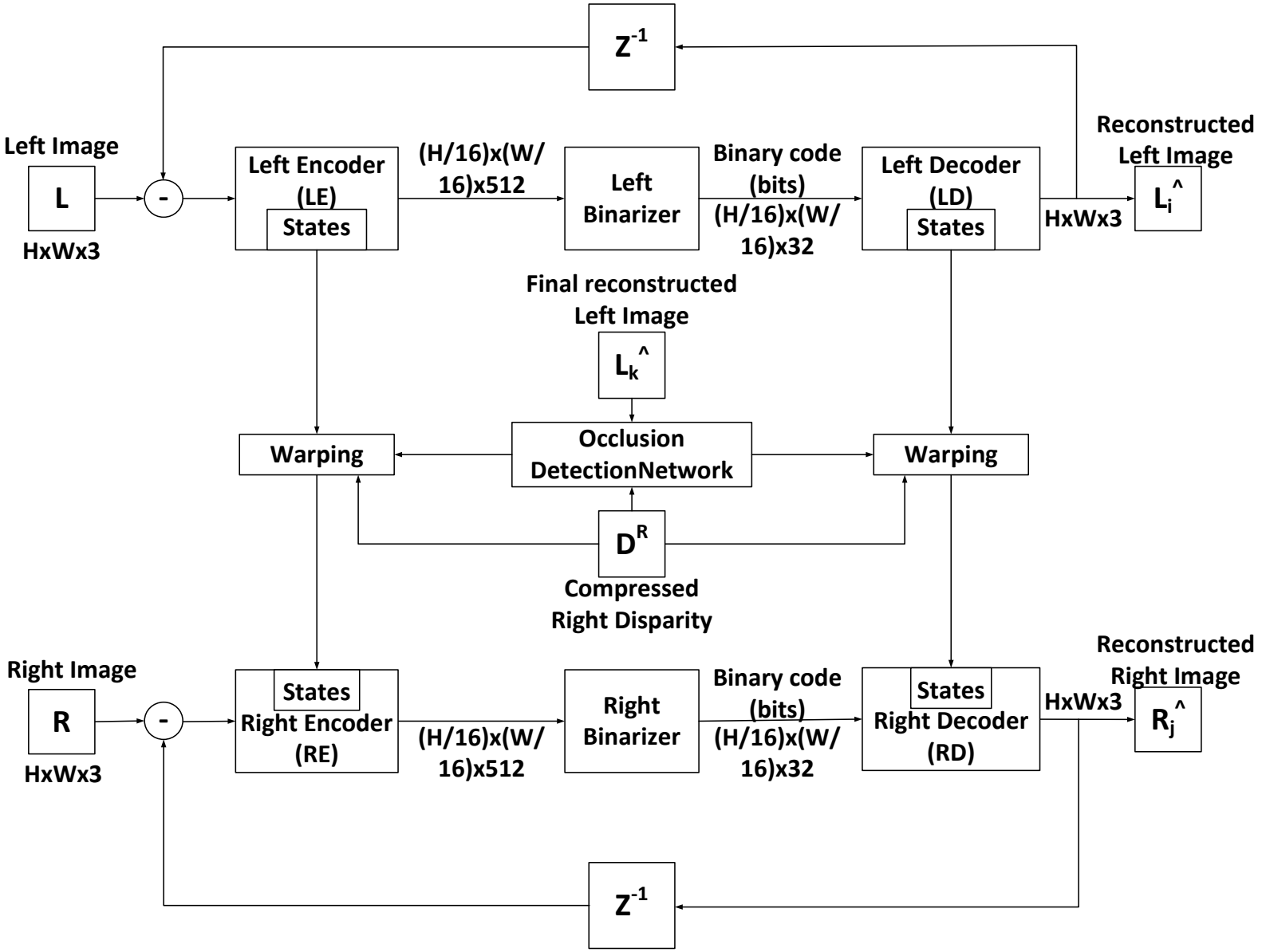
- **Proposed a recurrent neural network-based stereo compression method**
- **Proposed to share the states of the recurrent units of the network to eliminate the inter-view redundancy**
- **Utilize a convolution neural network to predict occlusion maps to remove wrong information from occluded areas**



Proposed Method

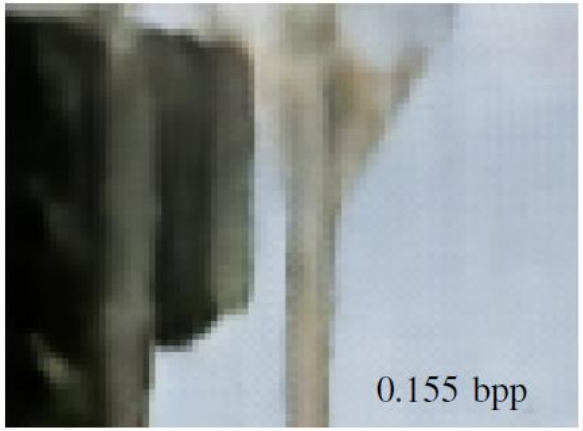
Block Diagram and Algorithm Flow

- Compress left image
- Compute and compress the right image disparity
- Warp the left image network states and final reconstructed left image
- Estimate occlusion map
- Initialize the right image network with warped states
- Compress right image

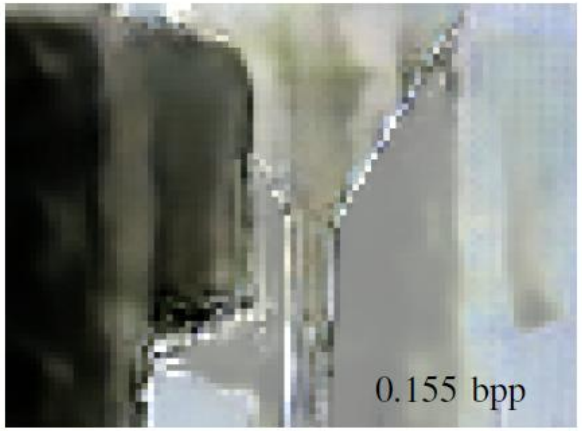


Result

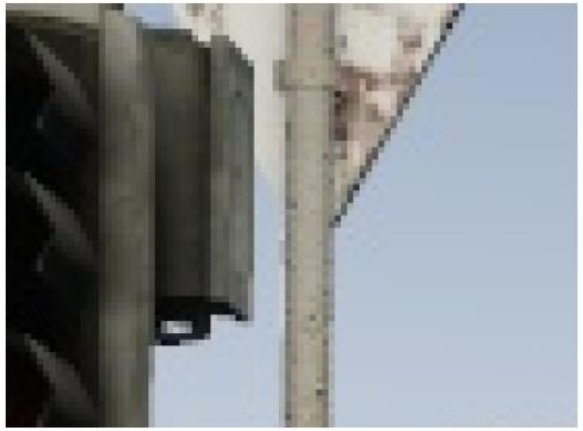
Effect of Occlusion Maps



w/ Occlusion Map



w/o Occlusion Map



Ground Truth

Occlusion Map

Result

Quantitative Comparison

Methods	Bit rate savings %			
	VKitti2		Kitti2012	
	PSNR (dB)	MS-SSIM (dB)	PSNR (dB)	MS-SSIM (dB)
RNNSC	**15.84**	15.00	**12.24**	11.72
HEVC Inter	3.11	**62.09**	-11.52	43.17
BPG	-5.55	60.73	-6.22	**50.48**
JPEG2000	-39.81	41.24	-46.96	34.16

Result

Visual Comparison Kitti2012

Conclusion

- Proposed a RNN-based stereo image compression method
- Ablation studies shows the effectiveness of the state-sharing module
- Outperforms all traditional codecs in terms of MS-SSIM for both synthetic and real world dataset
- Saves almost 10-30% of the bit rate as compared to the baseline RNN-based single image compression methods

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Thank you!