OMR: Occlusion-Aware Memory-Based Refinement for Video Lane Detection

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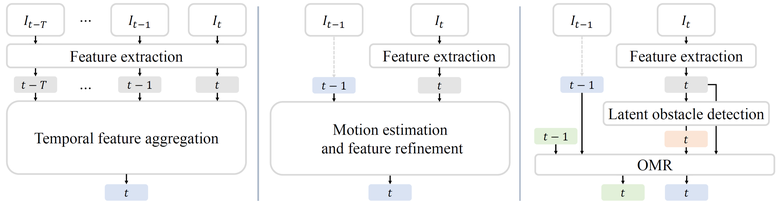
Introduction

Video lane detection

- Detect lanes in a current frame by exploiting past information
- Help to identify implied lanes more reliably
- Still, lane occlusions are challenging factors

Recent work

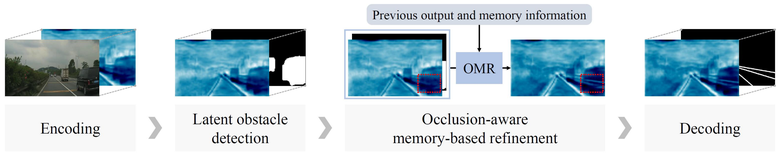


Contribution

- Improve lane detection results in a current frame by exploiting an obstacle mask and memory information
- Introduce a novel training strategy for video lane detection

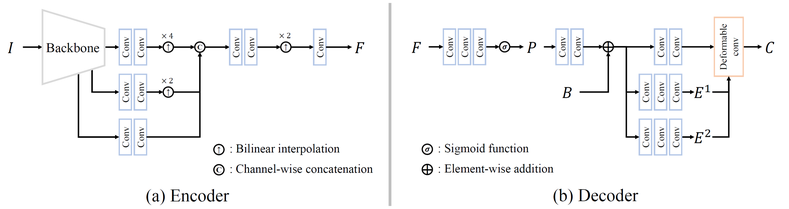
Proposed Algorithm

Overview



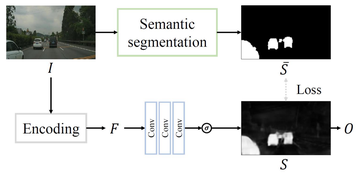
Encoding and decoding

- Given an image I, extract a convolutional feature map F
- From the feature map F, produce a lane probability map P and coefficient map C



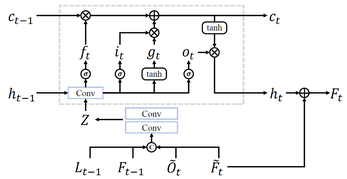
Latent obstacle detection

- Adopt a semantic segmentation algorithm
- Generate pseudo-labels of latent obstacles
- Train a lightweight obstacle detector



OMR

- Utilize the obstacle detection results from I_t, previous output from I_{t-1}, and memory information
- Perform a series of ConvLSTM operations



Data augmentation scheme

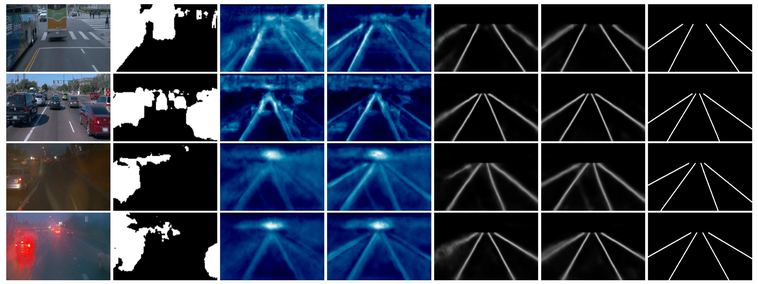
- Randomly select an object from the KINS dataset and then attach its full shape to the video frames
- Vary the size and position of the object linearly over frames

Experimental Results

Comparative assessment

	Approach	mIoU(↑)	F1(↑)	R_F(↓)	R_M(↓)
LaneNet [19]	Image-based	0.633	0.721	-	-
ENet-SAD [10]		0.616	0.755	-	-
LSTR [17]		0.573	0.703	-	-
RESA [40]		0.702	0.874	-	-
LaneATT [28]		0.664	0.823	-	-
MFIALane [24]		-	0.905	0.047	0.128
ADNet [34]		0.781	0.920	0.039	0.043
MMA-Net [39]	Video-based	0.705	0.839	0.042	0.127
LaneATT-T [27]		0.692	0.846	-	-
TGC-Net [33]		0.738	0.892	-	-
RVLD [11]		**0.787**	0.924	0.038	0.050
Proposed	Video-based	0.774	**0.936**	**0.026**	**0.038**

	Approach	mIoU(↑)	F1(↑)	R_F(↓)	R_M(↓)
MFIALane [24]	Image-based	0.697	0.723	0.061	0.300
CondLaneNet [15]		0.698	0.780	0.047	0.239
GANet [32]		0.716	0.801	0.048	0.198
CLRNet [41]		0.735	0.789	0.054	0.224
ConvLSTM [44]	Video-based	0.529	0.641	0.058	0.282
ConvGRUs [38]		0.540	0.641	0.064	0.288
MMA-Net [39]		0.574	0.573	0.044	0.461
RVLD [11]		0.727	0.825	**0.014**	0.167
Proposed	Video-based	**0.742**	**0.836**	0.016	**0.162**



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