ADNet: Lane Shape Prediction via Anchor Decomposition

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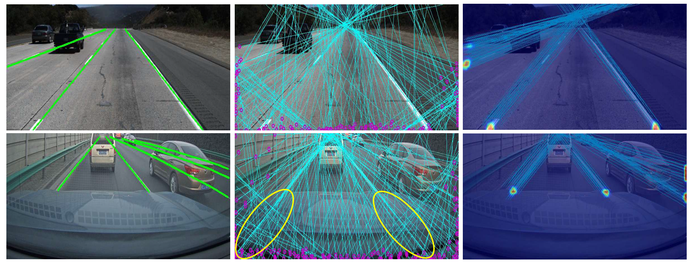
Introduction



(a) Annotations (b) Traditional (c) Ours

Illustrating different dynamic anchor proposal methods:
(a) Two scenarios: Top to bottom, only/not only ray from edges.
(b) Dispersed anchors: Only appliable for the first scenario.
(c) Our anchors: Ensured quality and flexibility in two scenarios.

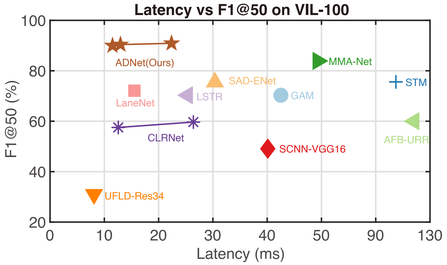
Experiments

Methods	F1@50 ↑	Acc ↑	FP ↓	FN ↓	FPS ↑
VOS Methods					
GAM [17]	70.30	85.50	24.1	21.2	24
RVOS [38]	51.90	90.90	61.0	11.9	-
STM [28]	75.60	90.20	22.8	12.9	10
AFB-URR [22]	60.00	84.60	25.5	22.2	9
TVOS [46]	24.00	46.10	58.2	62.1	36
MMA-Net [47]	**83.90**	**91.00**	**11.1**	**10.5**	20
Lane Detection Methods					
LaneNet [41]	72.10	85.80	12.2	20.7	64
SCNN-VGG16 [29]	49.10	90.70	12.8	11.0	25
SAD-ENet [16]	75.50	88.60	17.0	15.2	33
UFLD-R34 [31]	31.00	85.20	11.5	21.5	**124**
LSTR [25]	70.30	88.40	16.3	14.8	40
CLRNet-R18 [49]	57.27	88.99	6.9	13.5	80
CLRNet-R101 [49]	59.41	88.65	**2.1**	12.5	38
ADNet-R18* (Ours)	65.05	94.25	5.0	5.0	-
ADNet-R34* (Ours)	64.97	94.37	4.5	4.9	-
ADNet-R18 (Ours)	89.97	94.23	5.0	5.1	87
ADNet-R34 (Ours)	90.39	**94.38**	4.4	**4.9**	77
ADNet-R101 (Ours)	**90.90**	94.27	4.7	5.0	45

Experiment results on VIL-100

Method	F1@50 ↑	FPS ↑	Normal ↑	Crowded ↑	Dazzle ↑	Shadow ↑	No Line ↑	Arrow ↑	Curve ↑	Cross ↓	Night ↑
Segmentation Based											
SCNN-VGG16 [29]	71.60	25	90.60	69.70	58.50	66.90	43.40	84.10	64.40	1990	66.10
RESA-R50 [48]	75.30	65	92.10	73.10	69.20	72.80	47.70	88.30	70.30	1503	69.90
SAD-ENet [16]	70.80	33	90.10	68.80	60.20	65.90	41.60	84.00	65.70	1998	66.00
LaneAF-DLA34 [1]	77.41	28	91.80	75.61	71.78	**79.12**	**51.38**	86.88	**72.70**	1360	73.03
AtrousFormer-R34 [43]	**78.08**	-	**92.83**	**75.96**	**69.48**	77.86	50.15	**88.66**	71.14	**1054**	**73.74**
Keypoint Based											
PINet-Hourglass [19]	74.40	27	90.30	72.30	66.30	68.40	49.80	83.70	65.20	1427	67.70
FOLOLane-ERFNet [33]	78.80	-	92.70	77.80	**75.20**	79.30	52.10	89.00	69.40	1569	**74.50**
GANet-R34 [40]	**79.39**	69	**93.73**	**77.92**	71.64	**79.49**	**52.63**	**90.37**	**76.32**	**1368**	73.67
Parameter Based											
BézierLaneNet-R34 [9]	75.57	78	91.59	73.20	69.20	**76.74**	48.05	87.16	62.45	888	69.90
Laneformer-R50 [12]	**77.06**	-	**91.77**	**75.41**	**70.17**	75.75	**48.73**	**87.65**	**66.33**	**19**	**71.04**
Anchor & Detection Based											
FastDraw-R50 [30]	-	-	85.90	63.60	57.00	69.90	40.60	79.40	65.20	7013	57.80
UFLDv2-R34 [32]	76.00	**114**	92.50	74.80	65.50	75.50	49.20	88.80	70.10	1910	70.80
CurveLanes-L [42]	74.80	-	90.70	72.30	67.70	70.10	49.40	85.80	68.40	1746	68.90
LaneATT-R122 [35]	77.02	38	91.74	76.16	69.47	76.31	50.46	86.29	64.05	1264	70.81
SGNet-R34 [34]	77.27	-	92.07	75.41	67.75	74.31	50.90	87.97	69.65	1373	72.69
CondLane-R34 [24]	78.74	70	93.38	77.14	71.17	**79.93**	51.85	89.89	**73.88**	1387	73.92
CLRNet-R34 [49]	**79.73**	63	**93.49**	**78.06**	**74.57**	79.92	**54.01**	**90.59**	72.77	1216	**75.02**
ADNet-R18 (Ours)	77.56	87	91.92	75.81	69.39	76.21	51.75	87.71	68.84	**1133**	72.33
ADNet-R34 (Ours)	78.94	77	92.90	77.45	71.71	79.11	52.89	89.90	70.64	1499	74.78

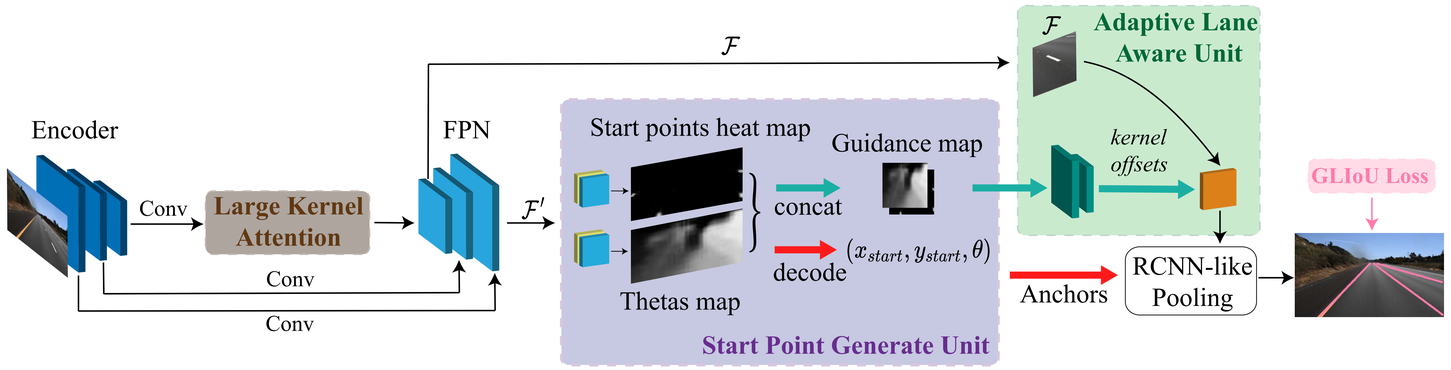
Experiment results on CULane



Baseline	+SPGU	+ALAU	+GLIoU	+LKA	F1@50
√					72.17
	√				76.47 (+4.30)
	√	√			76.91 (+4.74)
	√	√	√		77.15 (+4.98)
	√	√	√	√	**77.56 (+5.39)**

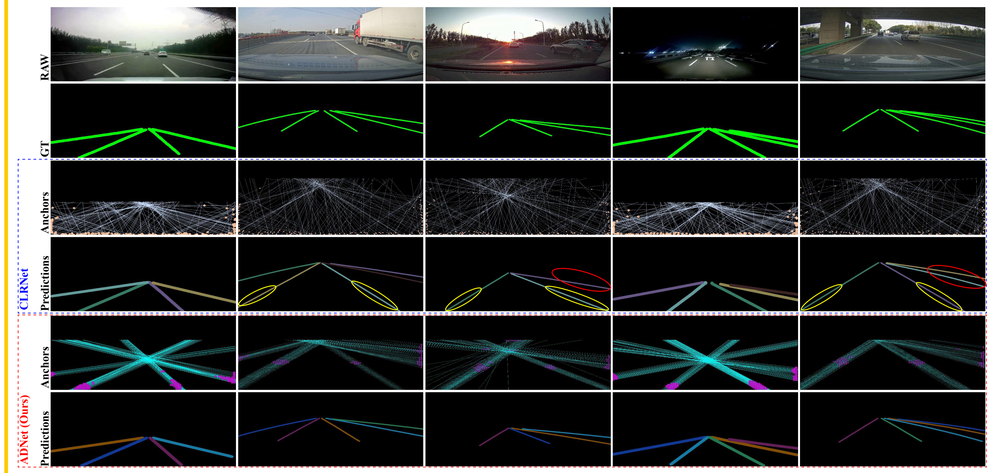
Ablation studies on CULane

Approach



Overview of our ADNet. Lane context first extracted by the encoder and enhanced by FPN embedded with Large Kernel Attention (LKA) , which plants after FPN's lateral layer to reduce computation cost. Then, low-level context $\mathcal{F}'$ is delivered into Start Point Generate Unit (SPGU) to generate start point guided anchors and guidance map, while high-level context $\mathcal{F}$ is further aggregated through Adaptive Lane Aware Unit (ALAU) with the help of the auxiliary guidance map. After pooling, we optimise lane lines via General Lane IoU loss.

Visualisation



Visualisation results on VIL-100