

MARS : Mask Attention Refinement with Sequential Quadtree Nodes for Car Damage Instance Segmentation

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Overview



What happened in evaluating car damages in Thailand?

- Evaluation of car damages in Thailand from an accident is a critical aspect of the car insurance business.
- The accuracy of the damage assessment is crucial in ensuring a fair payout to the policyholder and avoiding fraudulent claims.
- Our method, MARS, was extensively evaluated on the Thai car damage benchmark using quantitative and qualitative analysis.

Experiments and Analysis

This table shows qualitative comparisons on the Thai car damage dataset, where our MARS produces masks with substantially higher precision and quality than previous SOTA methods.

Method	Backbone	AP	AP50	AP75	APs	APm	API	FPS
Mask R-CNN [9]	R50-FPN	31.7	50.1	34.7	11.9	29.9	41.3	8.4
PointRend [13]	R50-FPN	33.9	51.7	36.4	12.3	31.0	42.2	4.6
Mask Transfuser [12]	R50-FPN	34.9	52.4	37.1	13.8	32.5	45.0	6.7
MARS (Ours)	R50-FPN	36.2	53.0	38.9	15.8	34.6	47.3	6.8
Mask R-CNN [9]	R101-FPN	32.4	51.5	35.1	17.6	33.6	42.0	8.1
PointRend [13]	R101-FPN	34.5	52.8	37.0	19.6	35.6	43.7	5.5
Mask Transfuser [12]	R101-FPN	35.1	54.9	37.7	20.9	37.5	44.4	7.1
MARS (Ours)	R101-FPN	37.5	55.7	41.2	22.7	38.7	45.1	7.2

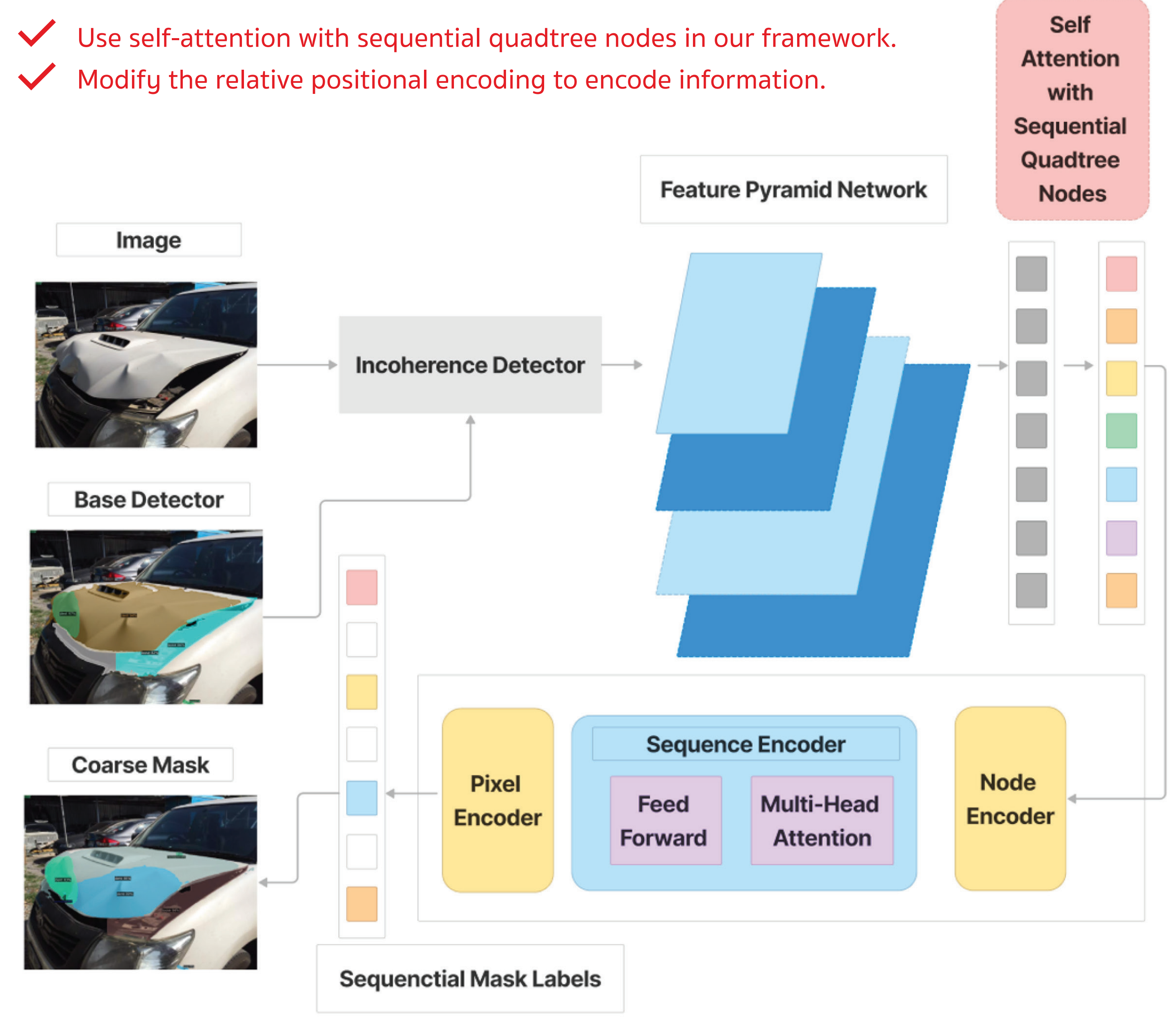
Results

Comparison with SOTA

- MARS utilizes a technique to predict masks that provide significantly more detailed information around the edges of objects.
- Our method, MARS, outperforms existing SOTA methods on the Thai car damage dataset.

Improving Model Design with MARS

- ★ MARS operates in the detected incoherent regions. Since it operates on feature points on the constructed quadtree, not in a uniform grid, we design a transformer architecture that jointly processes all incoherent nodes in all quadtree levels.



References

- 1 Ke, Lei, et al. "Mask transfuser for high-quality instance segmentation." Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition. 2022.
- 2 Kirillov, Alexander, et al. "Pointrend: Image segmentation as rendering." Proceedings of the IEEE/CVF conference on computer vision and pattern recognition. 2020.
- 3 He, Kaiming, et al. "Mask r-cnn." Proceedings of the IEEE international conference on computer vision. 2017.