Feature Pyramid Network based Proximal Vine Canopy Segmentation

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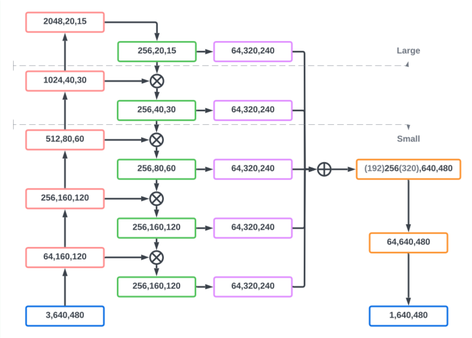
Context

Main motivation

- Segment the important plant parts
- Easier post-processing
- Speed / Robustness
- Good embedded performance

Architecture

- Feature pyramid network[3]
- Variable size



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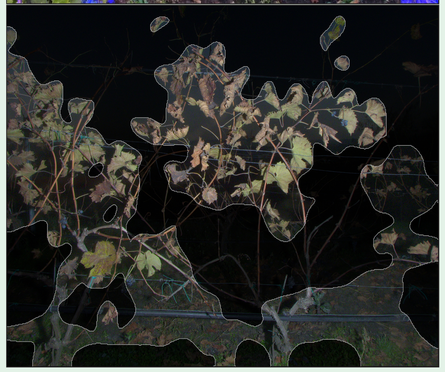
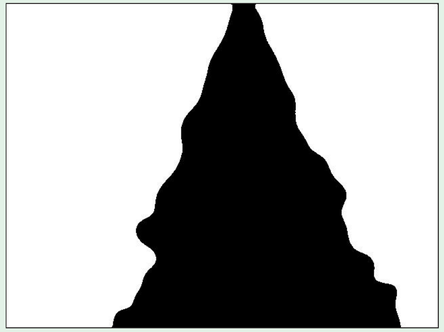
Numerical comparison

	Acc[%]	FP[%]	FN[%]	*IoU*[%]	Time[s]
OwnL	**94.7**	3.36	**1.95**	**77.78**	0.022
Own	94.26	3.08	2.66	76.91	0.018
OwnS	92.93	4.3	2.77	73.88	**0.005**
MRCNN[2]	92.71	5.17	2.11	73.16	0.177
MNetV3[1]	87.02	**2.28**	10.7	48.27	0.072

Device	Time[s]
Nvidia RTX3080 (10GB)	0.012
Nvidia A100 (40GB)	0.018
Nvidia TeslaT4 (16GB)	0.019
Jetson Xavier NX	0.085
Intel®Core™ i9-10900K	0.811
Intel®Xeon®Gold 6226R	0.934
Intel®Core™ i7-6700K	1.579

Results


Datasets

- Own at Cluj-Napoca, Romania. Using a DJI Mini 2 drone with a 4K camera
- Aghi et al. 2021[1]
- 600 total images of 640x480

References

[1] Diego Aghi, Simone Cerrato, Vittorio Mazzia, and Marcello Chiaberge. Deep Semantic Segmentation at the Edge for Autonomous Navigation in Vineyard Rows. In *IEEE/RSJ International Conference on Intelligent Robots and Systems, IROS 2021, Prague, Czech Republic, September 27 - October 1, 2021*, pages 3421–3428. IEEE, 2021.

[2] Kaiming He, Georgia Gkioxari, Piotr Dollár, and Ross B. Girshick. Mask R-CNN. In *IEEE International Conference on Computer Vision, ICCV 2017, Venice, Italy, October 22-29, 2017*, pages 2980–2988. IEEE Computer Society, 2017.

[3] Tsung-Yi Lin, Piotr Dollár, Ross Girshick, Kaiming He, Bharath Hariharan, and Serge Belongie. Feature Pyramid Networks for Object Detection. In *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition*, pages 2117–2125, 2017.