Deep Globe Building Extraction Challenge

2018. 05. 03

Objective & Background

- CVPR 2018 Workshop
- Automatically detecting buildings from satellite images
- Binary segmentation problem to localize all building polygons in each area
- Same data and evaluation methods as SpaceNetChallenge

Data: Input Files: Overview

City	Area (Sq. Km)	Building Labels (Polygons)	Amount (GB)
Vegas	216	151367	23+7.9
Paris	1030	23816	5.3+1.8
Shanghai	1000	92015	23.4+7.7
Khartoum	765	35503	4.7+1.6

Image size: 200m*200m

Image format: GeoTiff

Data collection: Digital Globe Worldview-3 Satellite

Data source: SpaceNet Building Dataset

Data downloading: Amazon Online Service

Data: Input Files Satellite Images

4 different types:

- PAN: panchromatic (single channel, 16-bit grayscale, ~30 cm resolution)
- MUL: 8-band multi-channel (8*16-bit, ~1.2m resolution).
- RGB-PanSharpen: pan-sharpened version of Red-Green-Blue bands from the multispectral product (3 channels, 3*16-bit, ~30 cm resolution).
- MUL-PanSharpen: pan-sharpened version of MUL (8 channels, 8*16 bit, ~30 cm resolution)

Method

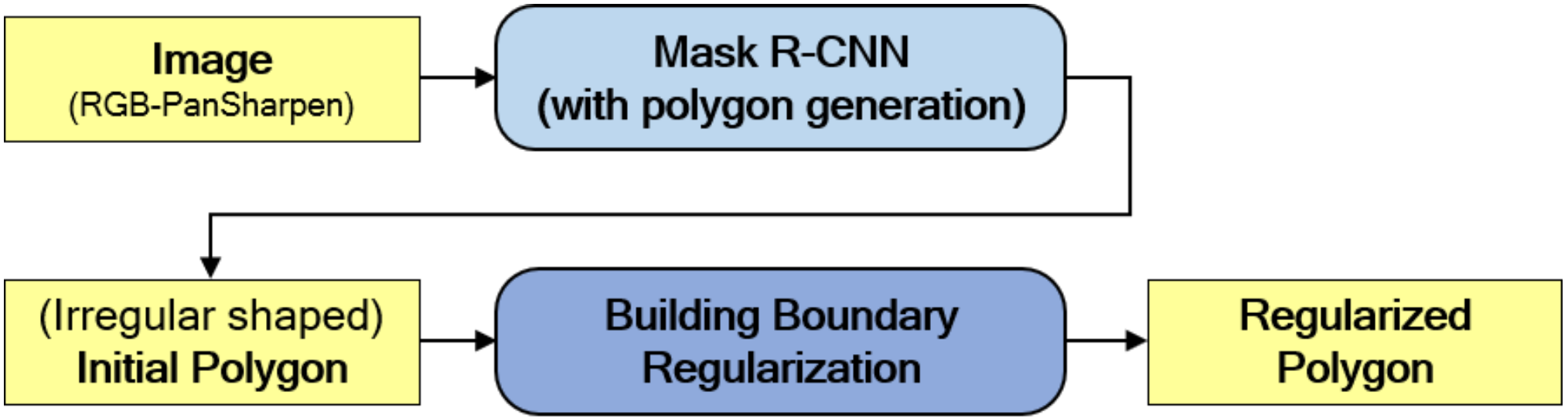
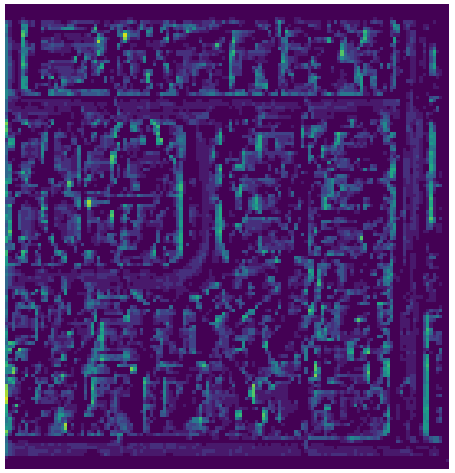
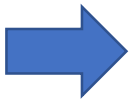
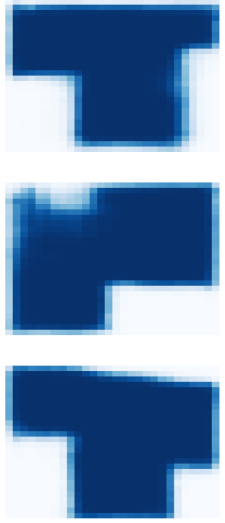


Image
(RGB-PanSharpen)
Mask R-CNN
(with polygon generation)
(Irregular shaped)
Initial Polygon
Building Boundary
Regularization
Regularized
Polygon

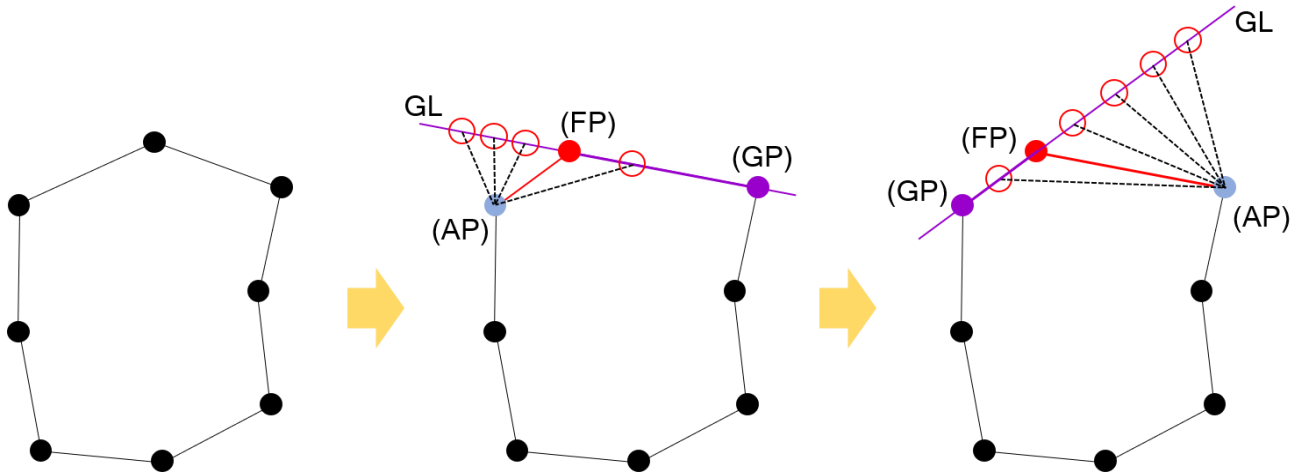
Method: Instance Segmentation

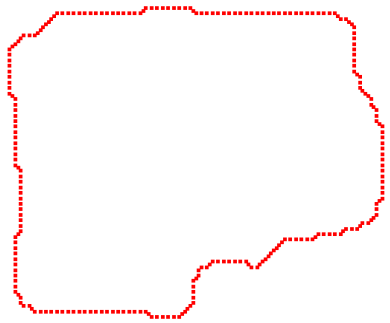




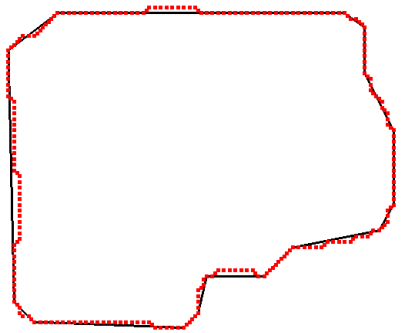


Method: Polygon Regularization

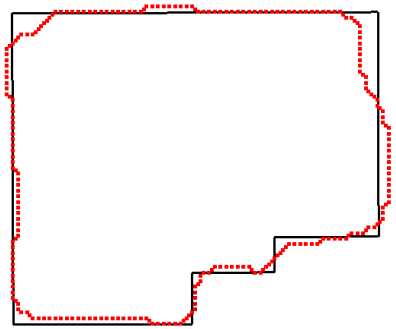




Boundary points



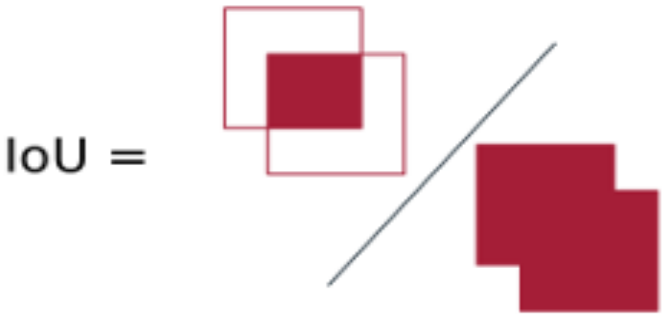
Initial boundary



Regularized boundary

Result: Evaluation Metric

- IOU (Intersection over union)



  true positive if IOU>0.5

  false positive otherwise

- F1 Score

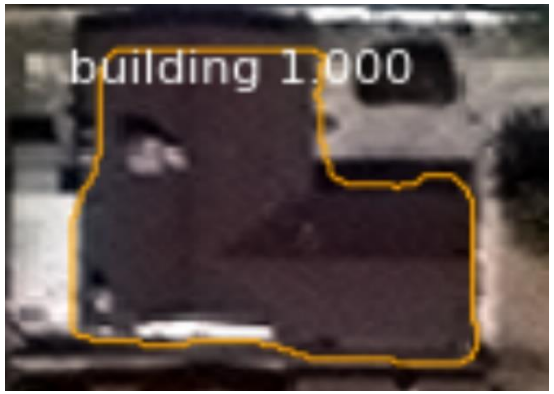
  F1 score = 2 * Precision * Recall / (Precision + Recall)

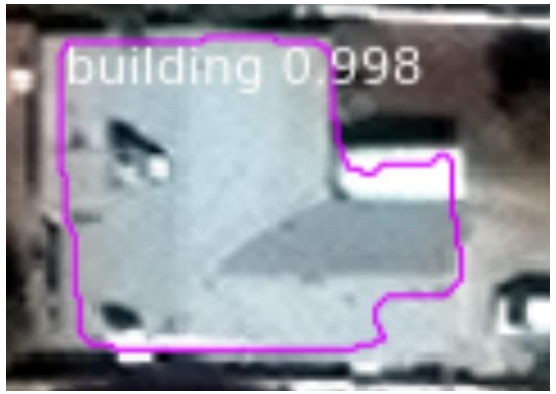
Result: Accuracy

Method	F1 Score (Individual City)				Total F1 Score
	Vegas	Paris	Shanghai	Khartoum	
Nofto	0.787	0.584	0.520	0.424	0.579
Wleite	0.829	0.679	0.581	0.483	0.643
XD_XD	0.885	0.745	0.597	0.544	0.683
Mask R-CNN	0.881	0.760	0.646	0.578	**0.717**
Mask R-CNN + Regularization	0.879	0.753	0.642	0.568	0.713

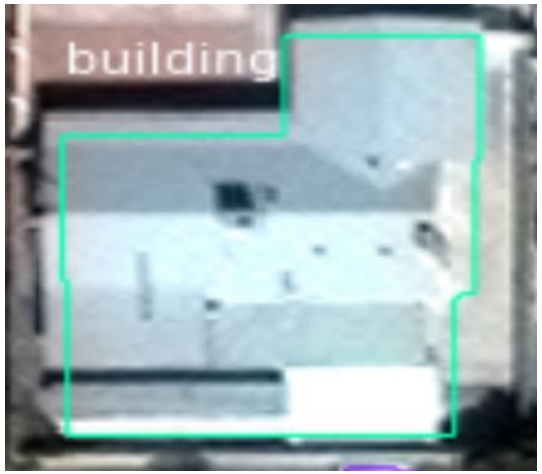
Building Extraction Accuracy: Ranked 3rd in current competition

Result: Polygon Regularization





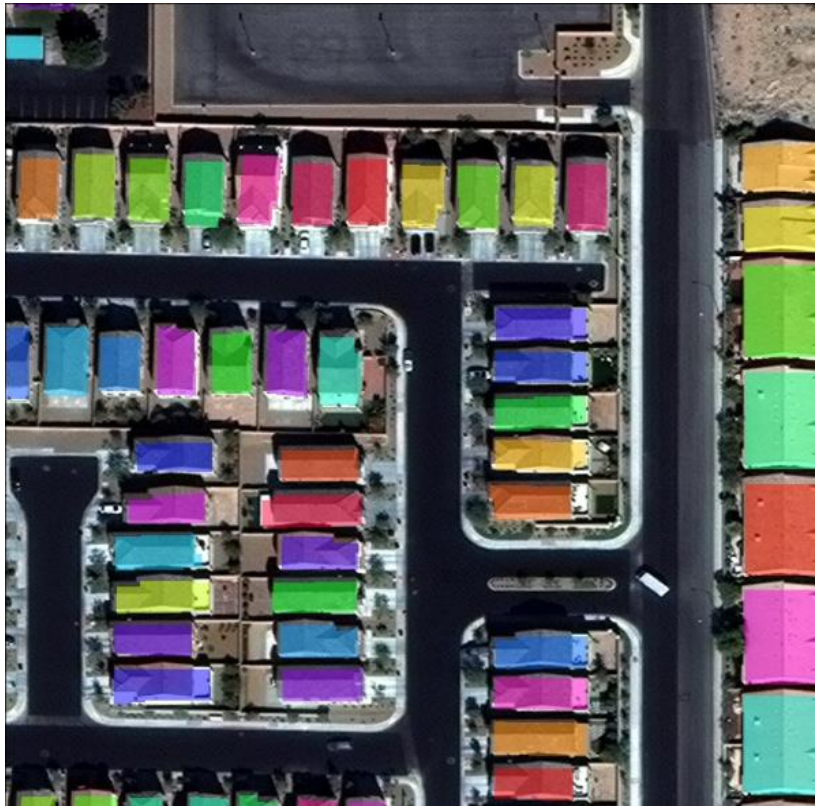
Mask



Polygon

Result: Special Cases

Small Buildings



Closely Located Buildings

Reference

1. http://deepglobe.org/challenge.html
2. https://github.com/SpaceNetChallenge
3. https://wwwtc.wpengine.com/spacenet
4. https://community.topcoder.com/longcontest/?module=ViewProblemStatement&rd=16892&pm=14551