Electric Towers Segmentation by Unsupervised Domain Adaptation Approach

Group 15

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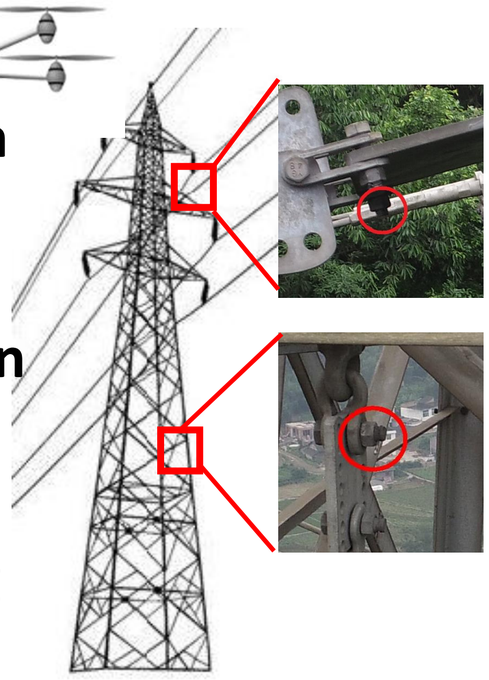
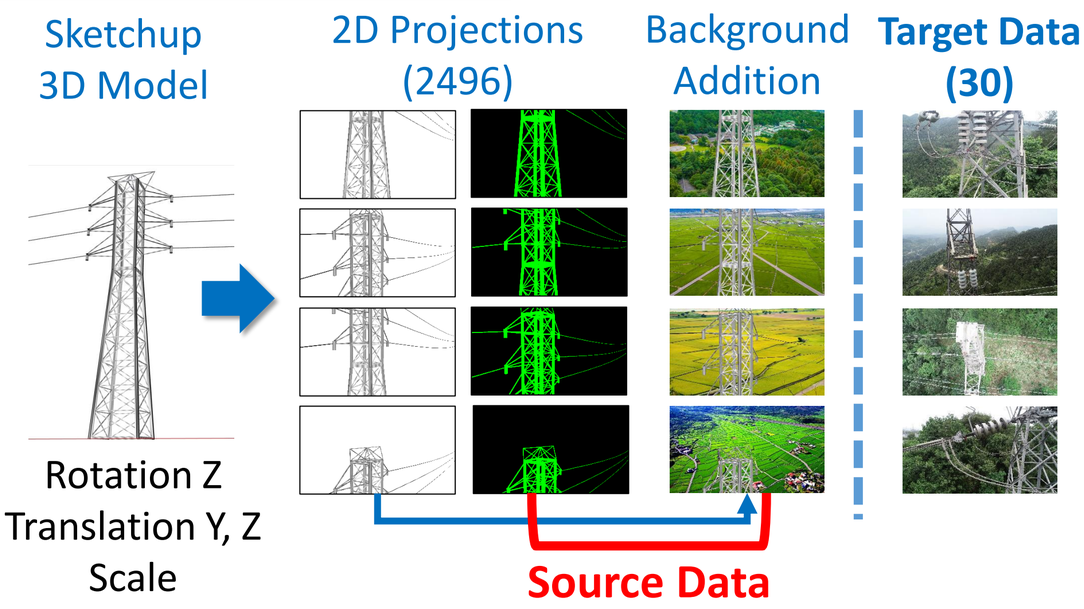
Introduction

Background

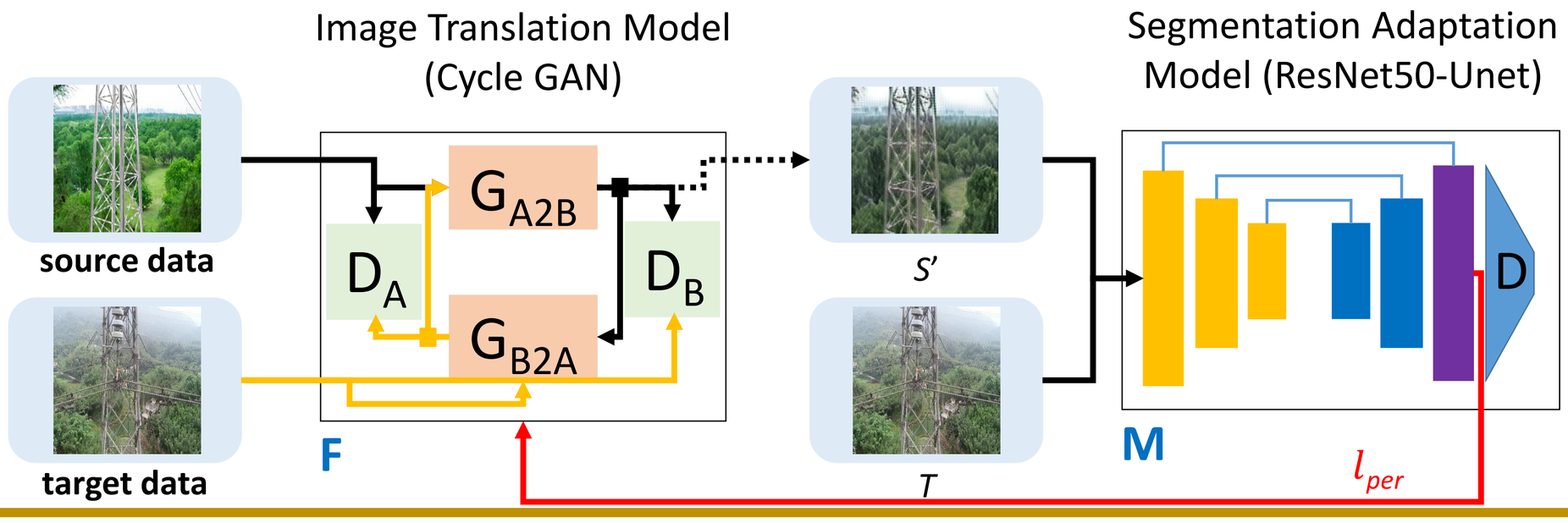
1. **Electric tower segmentation** by using images captured from the smart drone **for further automatic inspection**
2. Suffered from **the lack of ground truth** problem while segmented by deep learning approach



Data preparation



Proposed Method



$$\ell_{\mathbf{M}} = \lambda_{adv}\ell_{adv}(\mathbf{M}(\mathcal{S}'), \mathbf{M}(\mathcal{T})) + \ell_{seg}(\mathbf{M}(\mathcal{S}'), Y_{\mathcal{S}})$$

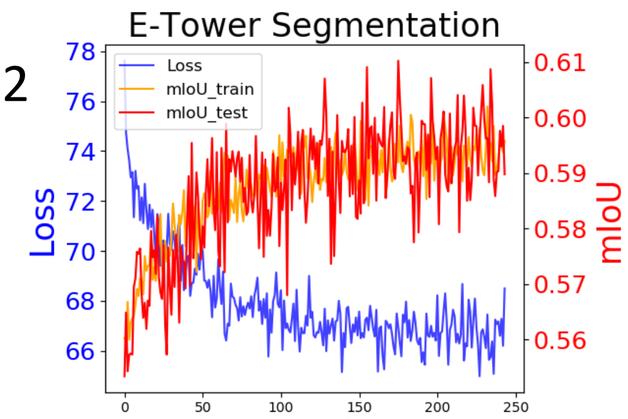
$$\ell_{\mathbf{F}} = \lambda_{GAN}[\ell_{GAN}(\mathcal{S}', \mathcal{T}) + \ell_{GAN}(\mathcal{S}, \mathcal{T}')] + \lambda_{recon}[\ell_{recon}(\mathcal{S}, \mathbf{F}^{-1}(\mathcal{S}')) + \ell_{recon}(\mathcal{T}, \mathbf{F}(\mathcal{T}'))] + \ell_{per}(\mathbf{M}(\mathcal{S}), \mathbf{M}(\mathcal{S}')) + \ell_{per}(\mathbf{M}(\mathcal{T}), \mathbf{M}(\mathcal{T}')$$

Experimental Results

1. Segmentation on source dataset *S* (upper bound)

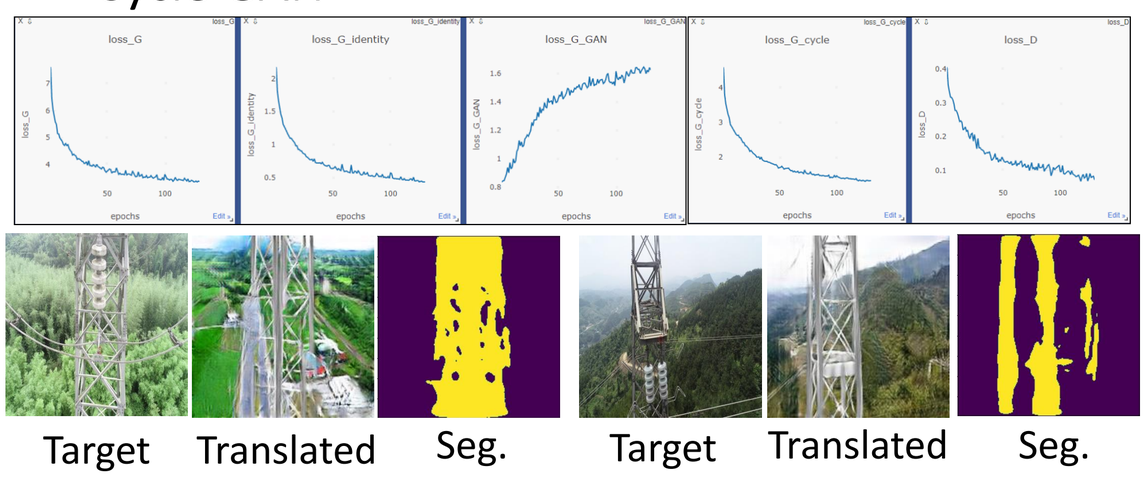
- Dice Loss
- Train/Val ratio: 0.8/0.2
- mIoU: **0.61**

source data *S* $M_S(S)$



2. Segmentation on translated dataset *S'*

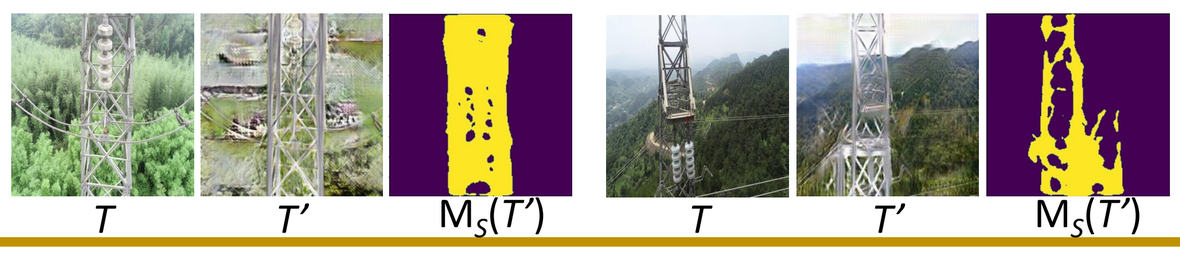
- Cycle GAN



Target data | Translated data | Seg. result | Target data | Translated data | Seg. result

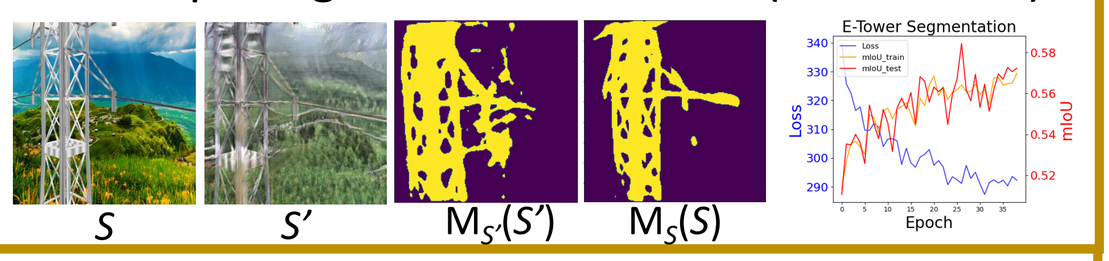
3. Segmentation by unsupervised domain adaptation

- Generator improvement (new generator/ old seg. model)



T *T'* $M_S(T')$ *T* *T'* $M_S(T')$

- Adapt. seg. model evaluation (mIoU: 0.58)



S *S'* $M_{S'}(S')$ $M_S(S)$

Reference

[1] Y. Li, L. Yuan, and N. Vasconcelos. Bidirectional learning for domain adaptation of semantic segmentation. In *The IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2019.

[2] J.-Y. Zhu, T. Park, P. Isola, and A. A. Efros. Unpaired image-to-image translation using cycle-consistent adversarial networks. *CoRR*, abs/1703.10593, 2017.