

Efficient Palm-Line Segmentation with U-Net Context Fusion Module

Toan Pham Van¹ Son Trung Nguyen¹ Linh Bao Doan¹
Ngoc N. Tran¹ Ta Minh Thanh²

¹R&D Department
Sun-Asterisk Inc.

²Faculty of Computer Science
Le Quy Don Technical University

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Motivation

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- Many cultures around the world believe that palm reading can be used to predict the future life of a person.
- Usability in biometric systems for verification, privacy security

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Related work

- Palm-Line Detection [Laura Liu, *et al* - 2005]
 - Canny Edge Detection

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 - 3D feature approached method
- Palm Print Biometric Recognition based on Scattering Wavelet Transform [Saranraj S, *et al* - 2016].
 - SWT feature

Main Drawback

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- Image processing base method

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Difficulty

- Small segmentation region (line)

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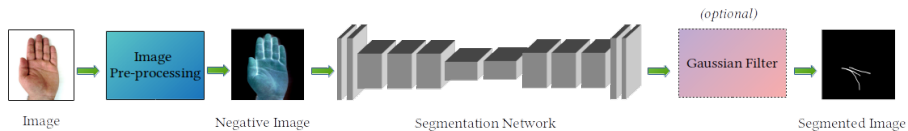
- Small segmentation region (line)
- Long-range dependence

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Workflow

Deep learning approaches



Dataset preparation

Image dataset for training

- We handcrafted our dataset from Google 11k Hands (in total)
- Remain diversity character of the original dataset

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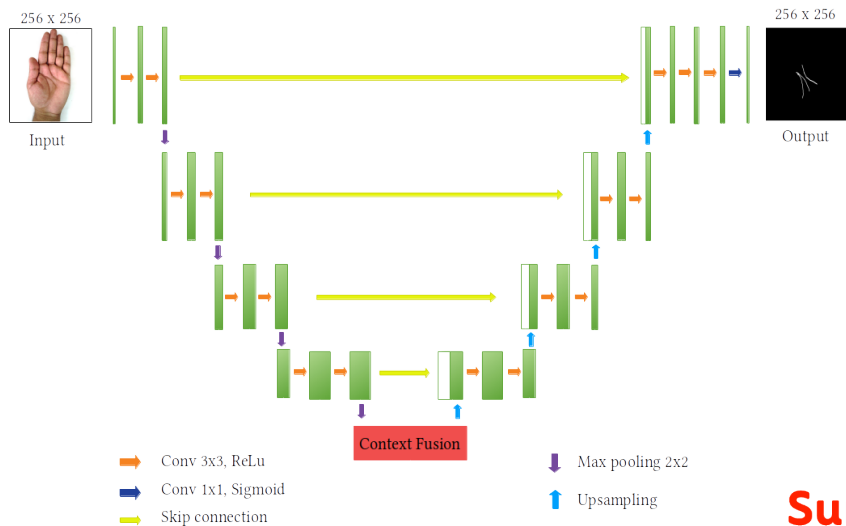
Image dataset for training

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Image Preprocessing

- The techniques we used including horizontal-Flip, shift scale rotate, random brightness contrast, and CLAH
- Negative image show the best results

Proposed Model

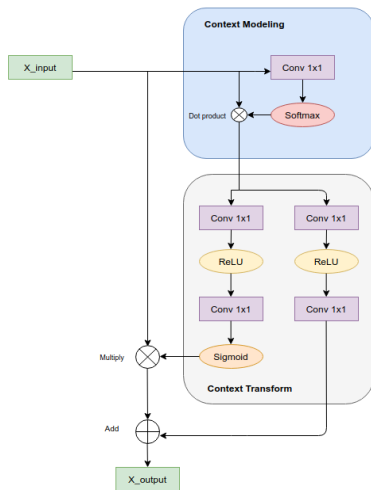


Context Fusion Module

Attention mechanisms

- focus on important regions of local feature
- reduce attention on irrelevant global features

Context Fusion Module



Comparison

Table: Quantitative comparison between U-Net, FPN and U-Net-CF

Method	Backbone	Params	F1 Score	mIoU
Unet	ResNet-34	24,456,299	98.89%	0.539
	ResNeXt-50	32,063,339	99.01%	0.535
FPN	ResNet-34	25,696,459	95.62%	0.356
	ResNeXt-50	28,179,403	96.01%	0.391
Unet-CF		10,270,115	99.42%	0.584

Post Processing - Gaussian Filter (Optional)

- Gaussian Filter are usually used to generate blur image. Our main purpose of using this filter is to reduce image noise or any excessive detail



Figure: Results with (right) and without Gaussian blur (left)

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- We employ deep learning methods to address the palm line segmentation problem
- For future work, further investigations can be done using other functionalities of the CFM module

Thank you for listening!