# End-to-end Piecewise Unwarping of Documents

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Project Page
https://bit.ly/AzSBUPW
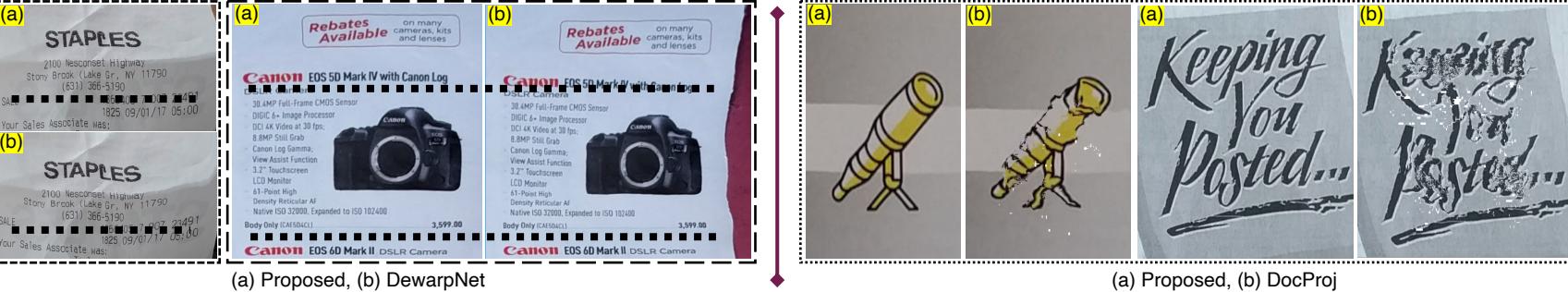
Motivation
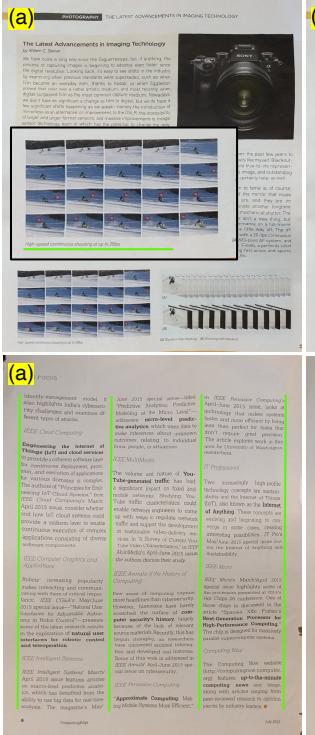
- Prior **patch-based local** unwarping approaches are:
  - **Not end-to-end** trainable.
  - Image level patch stitching strategies **leave artifacts**.
- Prior **end-to-end** approaches predict a global unwarping grid, often resulting:
  - **Less robust local unwarping**.
  - **Undesired warped regions**.

(a) Proposed, (b) DewarpNet

(a) Proposed, (b) DocProj
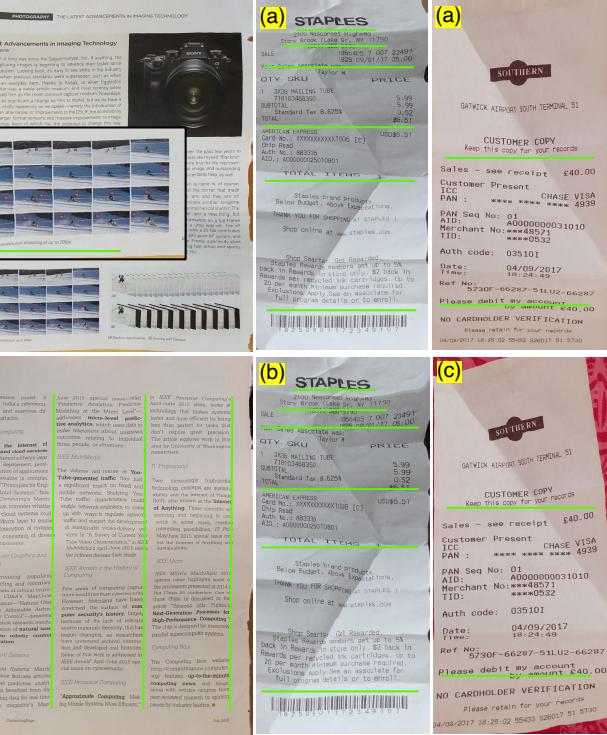
Contributions

- The first **end-to-end trainable piece-wise** framework which unwarps local deformations.
- The first **fully differentiable stitching network**: takes per-patch unwarping maps as input and produces a global unwarping map.
- We show significant **improvement in local unwarping quality**, which results in:
  - Better **(+5%)** image similarity metric (MS-SSIM).
  - Better and more stable **(+3%)** OCR Performance.

Experimental Results
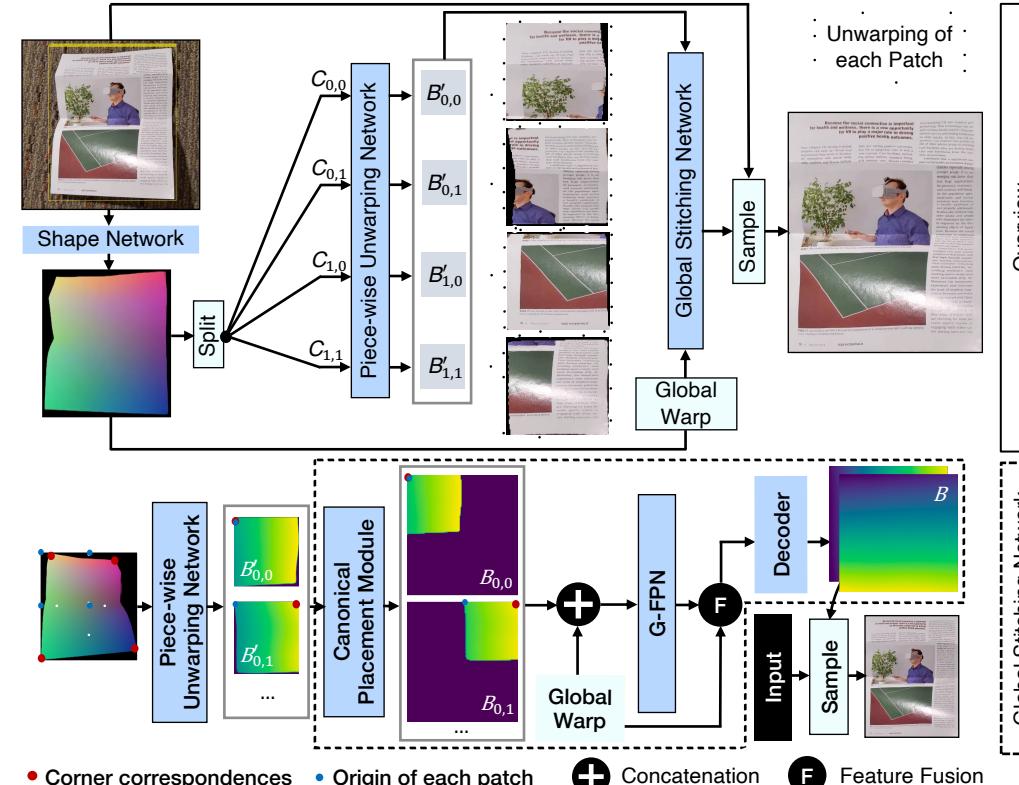
Follow **green cue lines** for better visualization.

(a) Proposed, (b) DewarpNet (c) DocProj

References:
1. Ke Ma, Zhixin Shu, Xue Bai, Jue Wang, and Dimitris Samaras. DocUNet: Document Image Unwarping via A Stacked U-Net. In Proc. CVPR. IEEE, 2018.
2. Sagnik Das, Ke Ma, Zhixin Shu, Dimitris Samaras, and Roy Shilkrot. DewarpNet: Single-image document unwarping with stacked 3D and 2D regression networks. ICCV, 2019.
3. Xiaoyu Li, Bo Zhang, Jing Liao, and Pedro V. Sander. Document Rectification and Illumination Correction using aPatch-based CNN.ACM Transactions on Graphics (TOG),2019

Method: Piecewise Unwarping

Unwarping of each Patch

Overview

Global Stitching Network

- ● Corner correspondences
- ● Origin of each patch
- ⊕ Concatenation
- Ⓕ Feature Fusion