Blur2Blur: Blur Conversion for Unsupervised Image Deblurring on Unknown Domains

What is the problem?

Classical Image Deblurring

- Early deblurring methods assume that the blur operator is linear and uniform.
- The blur can be approximated by a single convolution operator: $y = x * k + \eta$, where y, x, k, and η represent the blurry image, sharp image, blur kernel, and noise, respectively.

Supervised learning with paired data

- In supervised learning, training convolutional networks effectively requires extensive datasets comprising both sharp and blurry image pairs. Acquiring these datasets can be a complex and lengthy process, often necessitating advanced hardware and careful setup.

What has been done earlier?

- Current approach relies on pre-trained deblurring networks developed through supervised learning.
- Networks are trained on large datasets of paired blurry and sharp images.
- Aim is to transform blurry images into clear ones.
- These models often overfit and struggle with novel blurred images not captured by cameras in the training dataset.
- Empirical findings show that the performance remains unsatisfactory with real-world unseen blurs.

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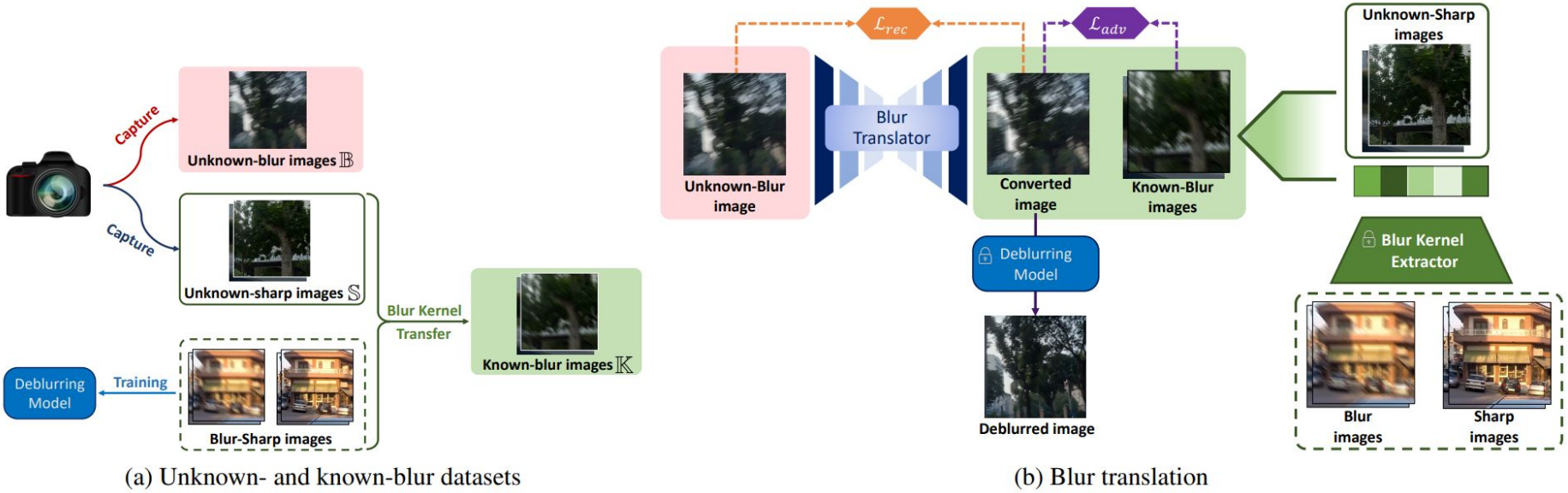
What novel solution proposed by the authors to solve the problem?

- We use unpaired data for deblurring, meaning the blurry and sharp images are collected separately without needing a direct match between them.
- This algorithm works by transforming a blurry input image, which is challenging to deblur, into another blurry image that is more amenable to deblurring.



(a) Unknown- and known-blur datasets

(b) Blur translation