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Blurry-Edges: A Deep-Learning Algorithm to Computationally Measure Image Depth

Technology ID

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Category

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Artificial Intelligence & Machine Learning/Computer Vision & Image Recognition

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Researchers at Purdue University have developed a novel approach to measure object depths from photon-limited images along defocused object boundaries. Extracting depth information from photon-limited, defocused images is challenging because depth from defocus (DfD) relies on accurate estimation of defocus blur, which is fundamentally sensitive to image noise. This innovative solution developed at Purdue overcomes traditional limitations to DfD by utilizing deep learning and a novel DfD relation. Their method is based on a new image patch representation, called Blurry-Edges, that stores and visualizes a rich set of low-level patch information, including boundaries, color, and blurriness. Using deep neural network architecture that predicts the Blurry-Edges representation, this method is capable of analytically calculating depth from low-quality, noisy images.

Technology Validation

The researchers validated that the Blurry-Edges approach achieved the highest depth estimation accuracy on photon-limited images compared to other state-of-the-art DfD methods.

Advantages

-Higher depth estimation accuracy

-Handles photon-limited or noisy images

-Leverages deep learning

Applications

-Helps camera companies who want to robustly measure object depths from photon-limited images better than current state-of-the-art depth-from-defocus methods, which can't deal with high noise level well.

Publication Link: https://arxiv.org/abs/2503.23606

Keywords: Computer Technology, depth from defocus, low-light imaging, boundary detection, computational imaging, deep learning, Algorithm