

Enhancing Nanofabrication at Scale via 3D Deconvolution Optimization



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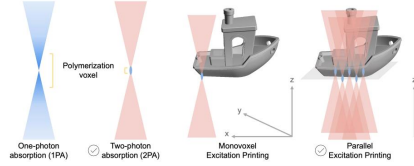
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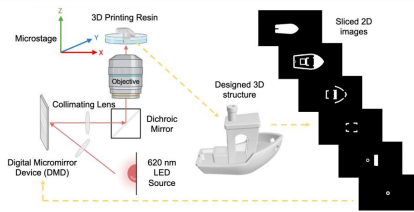


Motivation and Background

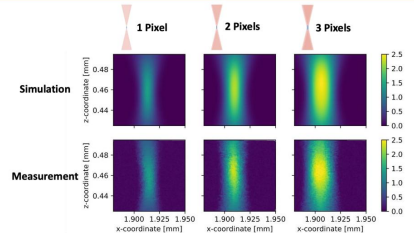
➤ Triplet-triplet annihilation upconversion (TTA-UC): a nonlinear process can be triggered by low-power input.



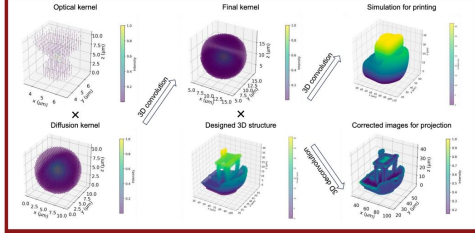
Printing Setup



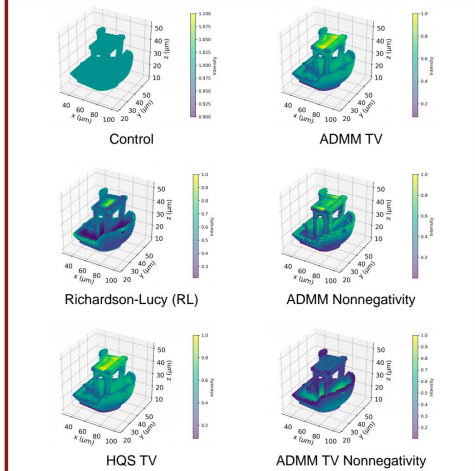
Proximity Effect



3D Simulation

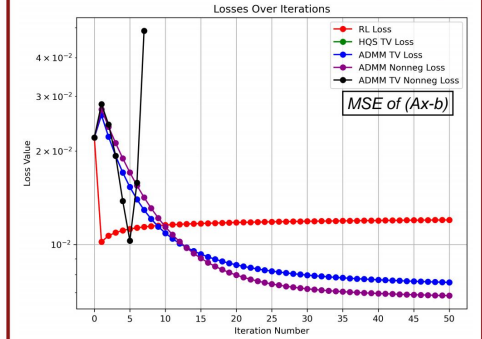


3D Deconvolution



Loss Evaluation

1: Initialize ρ and λ
 2: $x = \text{zeros}(W, H)$;
 3: $z = \text{zeros}(W, H)$;
 4: $u = \text{zeros}(W, H)$;
 5: for $k = 1$ to max_iters do
 6: $x - \text{update}$
 7: $z - \text{update}$
 8: $u - \text{update}$
 9: end for



Summary and Future Work

➤ ADMM with nonnegativity constraints outperforms all other algorithms due to a more robust penalty term and by preventing the explosion of negative values.

➤ Future work will include verifying the model and the algorithm by evaluating the printing results under a Scanning Electron Microscope (SEM).

References: 1. *Nat. Comm.*, **14**(1), 4412 (2023); 2. *Optics & Laser Tech.*, **169**, 110119 (2024); 3. *Foundations and Trends® in Machine learning*, **3**(1), 1-122 (2011); 4. *Applied Optics*, **60**(27), 8485-8492 (2021)