ZIHAN ZANG (臧梓涵)

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EDUCATION

Tsinghua University (THU), Beijing, China 2017 – Present

PhD candidate (Adviser: Prof. Yi Luo) in Electronics Engineering (EE), **expected May 2023**

Tsinghua University (THU), Beijing, China 2013 – 2016

B.S. in Electronics Engineering (EE)

RESEARCH INTERESTS

- I built LiDAR prototypes with various LiDAR detection modes (coherent/incoherent, focal-plane array/scanning, flood/structured illumination). I am interested in LiDAR architecture and beam steering technologies, especially in dispersion-based methods (spectral scan).
- I am more interested in design methodology and fabrication of diffractive/refractive elements (DOEs and freeform optics) by utilizing "end-to-end" optimization method and differential optical simulation engines. I am also interested in computational imaging and optical computing with photonic device optimization in the loop.

RESEARCH EXPERIENCE

Diffractive/refractive optical design towards computational imaging 2021 – Present

- Inverse design of diffractive/refractive optical elements (DOEs/ROEs) with grayscale lithography fabrication model. Design methods based on back-propagation and binary search are proposed. High-quality beam splitter and hologram are designed and fabricated.
- Fabrication of DOEs/ROEs using grayscale lithography and nano-imprinting.
- Inverse design of freeform lens using back-propagation. A fast and differentiable ray-tracing simulator is developed.
- Use re-parameterization to train opto-electronic co-designed computer vision system based on a single-layer diffracive neural network. An arrayed diffractive optical element is employed as the optical layer, which enables 30% deduction of multiply–accumulate (MAC) operations on both VGG13 and ResNet18 models.

Specrtrally scanning LiDAR 2018 – 2020

- Propose and implement *2D specrtrally scanning LiDAR*, which only uses solid-state dispersive elements as beam scanners (grating + optical cavity). A simplified design theory of VIPA cavity as a 2D spatial disperser is proposed.
- Based on the cavity disperser design, we also achieved *ultrafast framerate LiDAR* (>1 kfps) with high resolution (>200 lines).
- Propose and implement *all-optical specrtro-temporal encoded LiDAR* with record acquisition rate.
- Phase noise compensation algorithm for coherent LiDAR systems.
- Novel diffractive element that can *convert 1D beam steering into 2D beam steering*.

Selected Publications

- **Zang, Z.**, Xu, Y., *et al.* (2022). *Spectrally Scanning LiDAR Based on Wide-Angle Agile Diffractive Beam Steering*. IEEE Photon. Technol. Lett., 34 (16), 850-853.
- **Zang, Z.**, Li, Z., *et al.* (2022). *Ultrafast parallel single-pixel LiDAR with all-optical spectro-temporal encoding*. APL Photonics, 7(4), 046102.
- Li, Z.*, **Zang, Z.***, *et al.* (2021). *Solid-state FMCW LiDAR with two-dimensional spectral scanning using a virtually imaged phased array.* Optics Express, 29(11), 16547-16562. **(Monthly top downloads of *Optics Express* journal)**
- Li, Z.*, **Zang, Z.***, *et al.* (2021). *Virtually imaged phased-array-based 2D nonmechanical beam-steering device for FMCW LiDAR.* Applied Optics, 60(8), 2177-2189.
- Li, Z.*, **Zang, Z.***, *et al.* (2021). *Multi-user accessible indoor infrared optical wireless communication systems employing VIPA-based 2D optical beam-steering technique.* Optics Express 29 (13), 20175-20189.
- **Zang, Z.***, Wane, H., *et al.* (2021). *Planar multi-aperture fish-eye lens using metagrating.* arXiv preprint arXiv:2106.07872 (Submitting).
- **Zang, Z.***, Wane, H., *et al.* (2022). *DAD vision: opto-electronic co-designed computer vision with division adjoint method.* arXiv preprint (Submitting).

Conferences

- **Zang, Z.**, Xu, Y., *et al.* (2021, October). *Ultrafast agile optical beam steering based on arrayed diffractive elements.* In Asia Communications and Photonics Conference. (ACP) **(Postdeadline paper, 1 out of 10)**
- **Zang, Z.**, Li, Z., *et al.* (2021, May). *Ultrafast Parallel LiDAR with All-optical Spectro-temporal Encoding.* In 2021 Conference on Lasers and Electro-Optics (CLEO)
- Wang, H., **Zang, Z.**, *et al.* (2022, August). *64 $\times$ 64 spot-array generation based on freeform optics.* In 2022 Conference on Lasers and Electro-Optics/Pacific Rim (CLEO-PR)

Skills

- Programming Languages: MATLAB, Python (PyTorch), C++
- Software: ZEMAX, Lumerical FDTD, RSoft, Camera4D

♡ Awards & Misc.

Institute excellence scholarship, Tsinghua University	Oct. 2021
Volunteer of international Nano-Optoelectronics Workshop (iNOW 2019)	2019
Chairman of Tsinghua SIGS Optica student chapter	2018

Referee List

- Prof. Yi Luo — luoy@tsinghua.edu.cn
- Prof. Zhibiao Hao — zbhao@tsinghua.edu.cn
- Prof. Lai Wang — wanglai@tsinghua.edu.cn
- Prof. Hongyan Fu — hyfu@sz.tsinghua.edu.cn