Tianyu Luan

Address	Davis Hall, 301B Buffalo, NY 14228	**Phone** **Email**	+1 (716) 547-9341 tianyulu@buffalo.edu

Profile

I'm a 2nd-year PhD student at SUNY Buffalo working with Prof. Junsong Yuan on 3D reconstruction. My research interest covers human body/hand pose estimation & mesh reconstruction.

Education

2021- **State University of New York at Buffalo**, Buffalo, NY, United States

Ph.D. student (2nd year), Computer Science.

2014-2017 **Tsinghua University**, Beijing, China

M.Eng., Electronic Engineering.
Thesis: LED Frequency Response in Visual Light Communication.

2009-2013 **University of Science and Technology of China** , Hefei, China

B.S., Applied Physics.

Experiences

May 2022 - Aug 2022 **OPPO Research**, Palo Alto, CA, United States
Research Intern

3D hand reconstruction & mesh detailed evaluation.

Jul 2019 - Jun 2021 **Chinese Academy of Science**, Shenzhen, China
Research Assistant

3D human body reconstruction & pose estimation.

Jun 2017 - Apr 2019 **HUAWEI Techonology Co. Ltd.**, Shenzhen, China
Software Engineer.

3D human face/object reconstruction R&D.

Selected Works

- **3D hand reconstruction with shape details.**

  We provide a frequency split solution to reconstruct high fidelity hand mesh from monocular RGB inputs. We provide a frequency split network to generate high-fidelity hand in a coarse-to-fine manner, a dense parametric-based hand model for better representation, and a frequency-based loss to penalize high-frequency errors. The work will be submitted to ICCV2023.

- **Human perception aligned 3D shape metric.**

  We designed a spectrum-based 3D metric used on mesh shape comparison which is much closer to human perception than previous methods. Our metric design is purely based on mesh geometry spectrum analysis. Without using deep learning, our metric outperforms the SOTA learning-based and non-learning-base methods. The work has been accepted by CVPR2023.

- **Pose calibrated 3D human mesh reconstruction.**

  We proposed a kinematic-based light-weighted framework to calibrate human body mesh using a human pose estimator. The pose estimator and human body mesh are designed in a plug-in manner. Thus, using this framework, we can easily get a more accurate human mesh whenever we have a better human pose estimator. The work is published in AAAI2021 Main Track.

- **Video-based 3D human pose estimation via dynamic joint connections.**

  We proposed a dynamic connected GCN network for human pose estimation, so that the correlations between joints are dynamically trained by the network and not constrained by physical connections. When our method using only 4 frames of 2D pose as input, it outperformed the 200-frame SOTA result. The work is published in IEEE Transactions on Image Processing (TIP).

- **RGB-D sequence based human face reconstruction.**

  We reconstruct human face mesh from Depth video using ICP and TSDF. We also generate a texture map for the mesh from a selected frame set in color video using graph-cut. The project is implemented in C++, and we provided a demo show of this project at the HONOR V20 release event.

- **Robust Real-time feature point detection for SLAM system.**

  We provide a HOG-based feature extractor for SLAM system. It is more robust than SURF on weak textures (i.e., white walls, tiles) and much fast than SIFT. This feature extractor is implemented in HUAWEI AR Engine.

Publications

[1]. **Luan, Tianyu**, *et al.* "High Fidelity 3D Hand Shape Reconstruction via Scalable Graph Frequency Decomposition" *Accepted by IEEE / CVF Computer Vision and Pattern Recognition Conference (CVPR), 2023.*

[2]. **Luan, Tianyu**, *et al.* "PC-hmr: Pose calibration for 3d human mesh recovery from 2d images/videos." *Proceedings of the AAAI Conference on Artificial Intelligence*. Vol. 35. No. 3. 2021.

[3]. Zhang, J., Wang, Y., Zhou, Z., **Luan, T.**, Wang, Z., Qiao, Y. "Learning dynamical human-joint affinity for 3d pose estimation in videos." *IEEE Transactions on Image Processing* 30 (2021): 7914-7925.

Skills

Programming: *Python, C++, Matlab*
Tools: *PyTorch, Blender, MeshLab.*
Mathematics: *Calculus, Linear algebra, Probabilities, Multi-view geometry, Discrete differential geometry.*