Heng Zhang

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Personal Statement

As a dedicated researcher, I am committed to bridging the gap between **simulation** and **reality** through the integration of differentiable physics and cutting-edge AI methodologies, particularly in the context of robotic systems.
Through my academic endeavors, I have earned both a Bachelor's and a Master's degree from Southeast University. In addition, I possess significant expertise in programming languages (C++, CUDA, Python, Rust), as well as proficiency with various frameworks, software applications, and operating systems.

Research Experience

Multibody Simulator 2024.8 - Present

- Developed a multibody simulator based on the XPBD and ABD from scratch, incorporating key components such as collision detection, constraint resolution, and numerical integration
- Various joint types were implemented to facilitate the simulation of robotic systems
- Enhanced the system's ability to load robotic models described in the URDF format
- Investigating novel approaches to handling contact interactions using implicit neural representations

Differentiable Robot Calibration, The University of British Columbia 2024.12 - Present

- Contributed to a differentiable robotic simulation framework for robot motion calibration, collaborating with Amazon Robotics and MIT
- Implemented transformer based algorithms using Warp and PyTorch
- Visualized the calibrated robotic system in Blender through scripted rendering

Automated 3D Clear Aligner Design, The University of Hong Kong 2023.8 - 2024-8

- Developed an automated system for designing 3D-printed clear aligners, to alleviate the significant effort required from physicians
- Created a finite element method (FEM) model of teeth to simulate orthodontic movements
- Automated the simulation process to streamline the design workflow
- Developed an algorithm that generates customized clear aligners based on patient-specific needs
- Validated the effectiveness of these generated aligners through rigorous testing

Publications

1. **H. Zhang**, L. Zhu, J. Shen and A. Song, **"Implicit Neural Field Guidance for Teleoperated Robot-assisted Surgery,"** IEEE International Conference on Robotics and Automation (**ICRA**), London, United Kingdom, 2023, doi: 10.1109/ICRA48891.2023.10160475.
2. **H. Zhang**, L. Zhu, Y. Xiang, J. Zheng and A. Song, **"Haptic Rendering of Neural Radiance Fields,"** The ACM Symposium on User Interface Software and Technology (**UIST**), San Francisco, California USA, 2023, doi: 10.1145/3586183.3606811.
3. **H. Zhang**, L. Zhu, Q. Chen, A. Song and L. -F. Yu, **"Augmenting Conversations With Comic-Style Word Balloons,"** in IEEE Transactions on Human-Machine Systems (**THMS**), vol. 53, no. 2, pp. 367-377, April 2023, doi: 10.1109/THMS.2022.3224767.
4. **H. Zhang**, L. Zhu, **"Differentiable Collaborative Patches for Neural Scene Representations"** in IEEE Transactions on Emerging Topics in Computational Intelligence (**TETCI**) doi: 10.1109/TETCI.2024.3414952.
5. L. Zhu, X. Jiang, J. Shen, **H. Zhang**, Y. Mo and A. Song, **"TapeTouch: A Handheld Shape-changing Device for Haptic Display of Soft Objects,"** in IEEE Transactions on Visualization and Computer Graphics (**TVCG**), vol. 28, no. 11, pp. 3928-3938, Nov. 2022, doi: 10.1109/TVCG.2022.3203087.

References

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