JINGHAN KE

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EDUCATION

B.S. in Computer Sciences, University of Science and Technology of China (USTC) July, 2024 (expected)

PUBLICATIONS

1. Chengkai Hou, Zhengrong Xue, Bingyang Zhou, **Jinghan Ke**, Lin Shao, Huazhe Xu.*Key-Grid: Unsupervised 3D Keypoints Detection using Grid Heatmap Features.* [Under Review]: submitted to Computer Vision and Pattern Recognition Conference (CVPR 2024).
2. Qinsi Wang* , **Jinghan Ke***, Zhi Liang.*MathNAS: If Blocks Have a Role in Mathematical Architecture Design.* Neural Information Processing Systems (NeurIPS 2023).
3. Xinghao Zhu, **Jinghan Ke**, Zhixuan Xu, Zhixin Sun, Bizhe Bai, Jun Lv, Qingtao Liu, Yuwei Zeng, Qi Ye, Cewu Lu, Masayoshi Tomizuka and Lin Shao. *Diff-LfD: Contact-aware Model-based Learning from Visual Demonstration for Robotic Manipulation via Differentiable Physics-based Simulation and Rendering.* Conference on Robot Learning (CoRL 2023). Oral Presentation(6.6%).

SELECTED RESEARCH EXPERIENCE

Human Dressing *#Robotics P&M #CG #Diff-sim #3D Keypoints* Aug. 2023 - present
Advisor: Prof. Lin Shao [NUS AP] , Prof. Harold Soh [NUS AP] , Dr. Wenqiang Xu[MIT Postdoc] *NUS, Singapore*

- Aim to build a real-time, random-pose, robotic dressing system that can wear shirts, pants, and shoes.

Keypoints Detection in the Deformable Objects *#3D Keypoints #Grid Heatmap* Apr. - Nov. 2023
Advisor: Prof. Lin Shao [NUS AP] , Prof. Huazhe Xu [THU AP] *China & Singapore*

- Developed an unsupervised autoencoder framework for 3D keypoints with semantic consistency on both rigid and deformable objects, using a grid heatmap for improved reconstruction and robustness.
- For my part, it's mainly about laying the groundwork for the Human Dressing project that I'm leading.

Accelerating Neural Architecture Search *#AutoML #Large Model Design #Edge Devices* Apr. - May., 2023
Co-author: Qinsi Wang [USTC RA] *USTC, China*

- Analyzed nearly a hundred top-tier conference papers on NAS to shape MathNAS thesis's core narrative and logic without mentorship or editorial guidance.
- Developed the concept of network potential energy, drawing from physics and social influence, to explain observed inverse proportionality in experiments.
- Engaged in discussions with collaborator and reviewers, refining experiments and theory, and providing insights highlighting our work's innovation.
- Enhanced research impact by releasing code and a poster (a quick overview), gaining 30 GitHub stars.

Model-based Learning from Demonstration *#Robotics P&M #CG #Diff-sim* Dec. 2022 - May., 2023
Advisor: Prof. Lin Shao [NUS AP] *USTC, China*

- Developed a gradient approximation technique for robotic manipulation using vector relations in a physics-based simulator, proving project feasibility.
- Pioneered an algorithm to extract object-specific segment sequences and masks sequences from sth-sth videos using instance segmentation (earlier than Segment Anything Model) and sth-sth motion detection.
- Created a self-supervised differentiable algorithm to reconstruct and extract object shapes and trajectories from monocular human demonstration RGB videos, surpassing CVPR 2023 NeRF's SOTA.

(Explanation of abbreviations: *#Robotics P&M* is robotics perception and manipulation; *#CG* is computer graphics; *#Diff-sim* is differentiable simulation; *#AutoML* is auto machine learning.)

SELECTED PROJECTS

WowKiddy *Project Leader* *Coursework of Operating Systems(The Elite Class)* [Code] Mar. – Jul. 2022
A distributed dataset platform for shared images and videos. Rated as the best for its Outstanding and Highly Innovative qualities.

- Constructed the distributed file system based on a distributed system framework: JuiceFS.
- Applied a graph database: Neo4j to connect files based on their meta information and tags.
- Developed a high-performance caching system using 'logical locality' guided by file metadata and tags.
- Converted videos to CSS Sprites(combinations of multiple frames) for web preview.
- Utilized system monitoring frameworks: Prometheus and Grafana for system monitoring.

SELECTED WORKING EXPERIENCE

Software Engineer and Marketing Manager, *Guizhou Millennium Longevity Biotech Co., Ltd.* Sep. – Nov., 2021
At a socially impactful poverty-alleviation enterprise, my key contributions were:

- Authored a global market report affirming our product's market-leading quality, influencing national industry standards.
- Promoted products at exhibitions, securing attention and fostering significant investment and research partnerships.
- Negotiated a reduction in testing fees by over 50% and engaged in early-stage negotiations for a business deal exceeding RMB 100 million (15 million US dollars).
- Initiated a logistics tracking platform, product WeChat mini-program, and a feedback analysis crawler.

RESEARCH SKILLS

Low-Level Programming and System Development	C/C++(STL) , Rust , GO , Verilog
High-Level Scripting and Database	Python(Pytorch) , MATLAB , MySQL
Debugging and Profiling Tools	GDB
System, Code Management, and Containerization	Bash , CMake , Git , Docker
Web Development and Frontend Technologies	HTML/CSS/JavaScript , Flask
Text Editing and Documentation	Markdown , LaTeX , Vim
Blockchain Technologies	Fabric
Modeling and Rendering	Pyredner , MitSuba3 , MeshLab , Blender , Houdini , Fusion 360 , SOLIDWORKS
Rigid and Cloth Simulator	Nimble/Jade , Pybullet , DiffCloth/DiffClothAi

SELECTED HONORS

2020 - 2023 **Outstanding Student Scholarship** University of Science and Technology of China

INTERESTS

Travel	*50+ cities, 15+ museums, 5+ renowned mountains.*	2021 - 2023, China
Cycling	*Cycled around the island, self-guided, solo, 945.1 km.*	Jul. 27 - Aug. 4, 2021, Hainan, China
Hiking	*Completed 42+ km of scientific expedition training.*	Oct. 1 - 3, 2019, Longjing River, Anhui, China

Obsessions:

- Groove involving kinesthetic, visual, and auditory elements.
- Transmission and reception of experiential wisdom: wandering across a thousand miles, delving into a thousand tomes, and crossing paths with innumerable hearts...

Research Interests:

- Aging user experience and service system design, particularly utilizing robotics.
- Robots designed for automated movie and music video filming.
- Robotics in virtual reality and virtual reality in robotics.