Yirun Li

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SUMMARY

- Four years of industry experience in AI, deep learning, and 3D reconstruction, enhancing autonomous systems and synthetic data generation. Demonstrated proficiency in employing simulation platforms and deep learning methodologies to drive innovation and optimize product and algorithm development.
- Software: Python/C++/Pytorch/CUDA/OpenCL/TensorRT/OpenVINO/Git.
- Statistics: Robot Simulation/Synthetic Data Generation/3D Reconstruction/Diffusion Model/Lane Detection.
- Language: English (IELTS: 7.0)

EDUCATION

Huazhong University of Science and Technology, Wuhan, China *09/2017-06/2020*

Master of Computer Science

Huazhong University of Science and Technology, Wuhan, China *09/2013-06/2017*

Bachelor of Software Engineering, Rank: 9/167

PROFESSIONAL EXPERIENCES

Research Project, supervised by Prof. Guillermo Goldsztein, Georgia Institute of Technology *08/2024-present*

Prompt-based 3D Scene Image Generation Using Large Language Models and Diffusion Techniques

- Developed a novel prompt-based 3D scene generation system in collaboration with Prof. Guillermo Goldsztein, leveraging large language models (LLMs) to parse scene prompts and generate preliminary 3D bounding boxes (bbox) and background elements.
- Employed a text-to-3D Diffusion model to generate foreground objects within each 3D bbox and projected these onto a 2D image using calibrated camera parameters, utilizing inpainting to seamlessly blend background elements and enhance realism and spatial depth.
- Completed the 2D scene by inpainting around projected foreground objects, effectively harmonizing the foreground-background interaction and producing visually coherent and immersive images.
- Enabled interactive, multi-turn adjustments to object placements within the scene via LLM, allowing for real-time, dynamic alterations to optimize spatial coherence and functional scene composition.

Simulation Algorithm Engineer, Dreame Technology Co., Ltd. *03/2022-present*

AI Synthetic Dataset Generation:

- Developed a synthetic data generation system including NVIDIA Isaac Sim platform-based simulation and Diffusion models to expand synthetic data variety, enabling more comprehensive and realistic training datasets for machine learning applications.
- Utilized the Isaac Sim platform to generate synthetic data by rendering diverse scenes with dynamic simulations, enhancing dataset complexity and realism. Focused on scenarios with varying lighting, object interactions, and environmental factors, supporting robust model generalization.
- Applied Diffusion models with LoRA (Low-Rank Adaptation) and inpainting to generate high-fidelity synthetic data, producing custom virtual scenes closely aligned with reference data. This method effectively modeled complex environments, enhancing dataset realism and adaptability for challenging scenarios.
- Collaborated closely with AI teams to refine data utility in deep learning model training, focusing on data format adaptation, annotation accuracy, and optimization for corner cases.
- Generated over 2,000,000 pieces of synthetic data for AI training. In particular, a depth estimation algorithm used in a stereo sensor utilized over 95% synthetic data, achieving an average disparity error of 1.5 pixels.

Construction of a 3D Simulation Platform for Robot:

- Designed and implemented a comprehensive 3D simulation platform for robotic vacuum cleaners on NVIDIA Isaac Sim, modeled the robotic vacuum and sensors, embedding real-life operational scenarios to test and refine vacuum cleaner algorithms, facilitating accurate simulation-to-software algorithm development.

- Enhanced the robotic vacuum cleaner software development lifecycle, offering a robust testing and debugging environment that improved algorithm accuracy and operational efficiency in simulated real-world conditions. Integrated the 3D simulation system into the company's automated testing workflow, enabling seamless execution of automated tests for new software algorithm versions, and conducted over 15,000 automated 3D simulation tests so far to validate algorithm performance across diverse virtual environments.

3D Reconstruction and Scene Simulation:

- Conducted advanced 3D indoor scene reconstructions utilizing the 3D Gaussian Splatting algorithm, achieving high levels of detail and accuracy in depth information and novel view rendering.
- Adapted the reconstruction process to incorporate laser point clouds and 2D poses from robotic vacuums as constraints, enhancing the sparse reconstruction process. Optimized motion planning strategies for the robotic vacuum to collect data sets more suitable for 3D reconstruction.
- Enhanced reconstructed scenes by incorporating and rendering object models, simultaneously generating datasets for object detection and semantic segmentation. This integration facilitated the creation of comprehensive and accurate data for further machine learning applications.

Vision Algorithm Engineer, UBT Robot Technology Co., Ltd., Shenzhen, China ***07/2020-03/2022***

RoboGo Autonomous Driving Car Vision Solution

- Contributed to the vision solution for RoboGo, an AI-driven autonomous driving educational vehicle, achieving Level 2-like autonomy through advanced AI technologies on a custom map. Enhanced the system's capabilities by integrating advanced AI technologies for accurate lane detection, obstacle recognition, and traffic signal interpretation on a custom map.
- Managed the collection, organization, and labeling of over 30,000 data; encompassing lane following, obstacle detection, and traffic light recognition for RoboGo's high-speed autonomous navigation and deployment on Arm platforms.
- Demonstrated strong scalability of the vision algorithm, which was successfully adapted and deployed in the company's electric wheelchair system for automated line-following navigation, extending its application to assistive technologies.

Master of Computer Science, Huazhong University of Science and Technology ***09/2017-06/2020***

Monocular Real-Time Dense Reconstruction on Mobile Devices:

- Engineered the core algorithm workflow, utilizing ARKit/ARCore for camera pose tracking, dense optical flow for depth mapping, and TSDF for 3D model fusion.
- Implemented and optimized the system for Android using NDK, ensuring real-time performance and high-quality 3D model generation with color information.

AWARDS AND RECOGNITION

Outstanding Graduate of Huazhong University of Science and Technology, 2017

Outstanding Student Scholarship of Huazhong University of Science and Technology, 2015.

Study Excellence Scholarship of Huazhong University of Science and Technology, 2014.