YAN LI [Projects]

Computer Vision and Machine Learning for Robotics

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Education:

Guest Editor: IJMIC . Services: ICRA, IROS, ICPR, ICSR, TCE, IJSR, etc.

- **Ph.D., University of Tennessee, Knoxville**, Knoxville, TN, U.S.A. 08/2014 to 05/2022
- **Master, Northwestern Polytechnical University, School of Automation**, China 09/2011 to 03/2014
- **B.S.E., Northwestern Polytechnical University, School of Automation**, China 09/2007 to 06/2011

Technical Skills

- **Programming Languages:** Python, C++, C#, C, Matlab,Java, etc.
- **Frameworks & Libraries:** PyTorch, Protobuf, JSON, ROS, CUDA, etc.
- **Technologies:** Imitation & Reinforcement Learning (Option/-GAIL, SAC, PPO, TRPO, DDPG, TD3, DQN), Robot Control, Legged Robot, Visual Inertial Odometry, Visual Perception, Multi-Modal Sensing.
- **Others:** 3D Printing, Real-Time Control, Optimization, Embedded System (Jetson TX2/Xavier), RViz, etc.

Professional Experience

Tech Lead & CoFounder, PacificDynamics, Dallas, TX [SBIR-NSF(in-processing)] 03/2024 to now

- **Forest Nursery Health Monitoring and Stock Inventory**: Fine-tuned LLaVA-13B for early-stage identification of pathological, water-related, and temperature-induced stress in pine saplings, and enhancing the pine sapling enumeration capability. **(On-going)**
- **Airborne Nursery Monitoring Automation**: Built a hexacopter drone and trained it to autonomously monitor inventory and plant health using an option-GAIL based policy. Integrated Llama3-8B to allow task scheduling and goal execution via human commands. **(On-going)**

Post-doc, Tickle college of Engineer, UTK, Knoxville, TN 03/2022 to 03/2024

- **Quadruped Robot for Dementia Care**: Boosted detection rate by 8.6% using fine-tuned CLIP. Developed a Llama2-7B LoRA module for robot task scheduling. Trained robot task execution policies via few-shot imitative reinforcement learning, Option-GAIL, DDPG, and SAC methods.
- **Care-giver Assistance Robot**: Boosted medical supply recognition mAP by 16.6% via fine-tuned CLIP. Trained Llama2-7B LoRA for nurse-robot interaction and robot function invocation.
- **Augmented Reality for House Construction**: Developed a laser-based AR projection system with dynamic sketch rendering, eliminating manual measurements and reducing construction time.

Software Engineer, Aubo Robotics, Knoxville, TN 05/2020 to 04/2021

- **Software & API**: Build the control software, forward, and inverse kinematics algorithm from scratch.
- **Robot Diagnostic Tools**: Developed the raw data stream diagnostic tools from scratch.

Research Projects

Few Shot Imitative Reinforcement Learning for Robot Manipulation Task 05/2021 to 04/2022

- **Build Teleoperated Cobot Digital Twin:** Based on ROS and HTC VR set for task data collection.
- **Proposed Task Evaluation Algorithm**: Generate sub-optimal episodes from collected and explored data.
- **Proposed Pretrain RGB-D Perception Model for Latent State**: Accelerate training process by 61.8%.
- **Proposed Heiarchical Imitative RL Framework** : Boost 51.8% of success rate for trajectory type tasks.

Level-2 (L2) Autonomous Driving Project 09/2017 to 05/2020

- **Panoptic Segmentation**: Boosted instance distinguishing accuracy by 12.8% via a proposed paradigm.
- **Thermal-RGB Vehicle Detection**: Boosted mAP by 23.2% in challenging light environments.
- **Lane Detection**: Built and deployed real-time lane detection on automotive-grade hardware.
- **Thermal-RGB Cameras Calibration**: Designed a calibration system and developed calibration algorithm.

Indoor Navigation for Blind People 09/2014 to 02/2018

- **Relative Motion Estimation:** Measure a real-scale rigid body motion through Visual-IMU sensor.
- **Camera-IMU Rotational Calibration**: Calibrate coordinate rotation use Lie group constraint.
- **Real-scale Scene Dense Depth estimation**: Fused IMU and visual data for realt-time depth estimation.
- **Ego-motion Tracking**: Robust ego motion tracking by complementing visual fail with IMU estimates.

Publications: Published: 10 Citations: 161 Google Scholar

- Li, Yan, Songyang Liu, Mengjun Wang, Shuai Li, and Jindong Tan. "Teleoperation-Driven and Keyframe Based Generalizable Imitation Learning for Construction Robots." (JCCE 2024).