Po-Jui 'Ray' Huang

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Education

M.S. in Electrical and Control Engineering,
National Yang Ming Chiao Tung University (NYCU), Taiwan. Feb. 2021 ~ Present
B.S. in Electrical and Computer Engineering,
National Chiao Tung University (NCTU), Taiwan. Sept. 2017 ~ Jan.2021

Research Interest

Robotics, Deep Reinforcement Learning, Navigation, Computer Vision

Projects and Publications

- **Cross-modal Contrastive Learning of Representations for Navigation**
  - J.-T. Huang, C.-L. Lu, P.-K. Chang, C.-I Huang, C.-C. Hsu, Z. L. Ewe, **P.-J. Huang**, and H.-C. Wang (2021), "Cross-Modal Contrastive Learning of Representations for Navigation using Lightweight, Low-Cost Millimeter Wave Radar for Adverse Environmental Conditions" *IEEE Robotics and Automation Letters, (RA-L)*. 6(2), 3333-3340.
  - We propose the use of single-chip millimeter-wave (mmWave) radar, which is lightweight and inexpensive, for learning-based autonomous navigation. Since mmWave radar signals are often noisy and sparse, a cross-modal contrastive learning for representations (CM-CLR) method was proposed to maximize the agreement between mmWave radar data and LiDAR data in the training stage. Our proposed end-to-end deep reinforcement learning policy (DRL) with contrastive learning successfully navigated the robot through smoke-filled maze environments and achieved better performance compared with generative reconstruction methods (cGAN and VAE), in which noisy artifact walls or obstacles were produced.
  - I am responsible for the UGV hardware and conduct the experiment.
- **Search and Rescue in DARPA Subterranean Challenge, Team NCTU**
  - C.-L Lu*, J.-T. Huang*, C.-I Huang, Z.-Y. Liu, C.-C. Hsu, Y.-Y. Huang, S.-C. Huang, P.-K. Chang, Z. L. Ewe, **P.-J. Huang**, P.-L. Li, B.-H. Wang, L.-S. Yim, S.-W. Huang, M.-S Bai, H.-C. Wang, "A Heterogeneous Unmanned Ground Vehicle and Blimp Robot Team for Search and Rescue using Data-driven Autonomy and Communication-aware Navigation" in *Field Robotics - Special Issue: Advancements and lessons learned during Phase I & II of the DARPA Subterranean Challenge*. (In Revision; *Equal Contribution)

- The DARPA Subterranean Challenge seeks novel approaches to rapidly map, navigate and search in underground environments. The urban circuit was held at an unfinished nuclear power plant in Elma, WA. Team NCTU ranked 8-th out of 10 teams in the Urban Circuit.
- I am responsible for the UGV hardware system and the spherical nodes that can be shot out like a cannonball for communication system.

- **Autonomous Navigation of Maritime Unmanned Surface Vehicle**
  - I audit Marine Autonomy, Sensing and Communications(MOOS-IvP) course given by MIT, the course focus mainly on software and algorithms for autonomous decision making by vehicles operating in the ocean environments. We accomplish the final project of the course at Bamboo Lake, Taiwan. Executing multi-vehicles waypoints navigation by MOOS using Duckieboats which are developed by our laboratory.
  - I am responsible for the communication between multi-vehicles and base station.

Skills

- **Programming Language:** Python, C/C++
- **Software, Middleware and Libraries:** Robot Operating System(ROS), Docker, Open3D, PCL
- **Deep Learning Framework:** PyTorch

Relevant Coursework

Object-Oriented Programming(A-), Automatic Control System(A-), Intelligent Robots Lab(A+), Human Centric Computing Lab(A+), Introduction to Algorithms(A-), Deep Learning and Practice(A), Robotics(A-), Sensing and Intelligent Systems(A+)