Wai-Sing (Derek) Ngan

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Professional Experience

ePropulsion Hong Kong SAR

Robotics Engineer, Advanced Driver-Assistance System (ADAS) Team *Aug 2022 – Present*

- **Perception System**
  - Implemented External Kalman Filter in C++ to fuse 9-axis IMU and GPS data, estimating surface vessel pose to enable ADAS features
  - Developed a regression model to predict vessel velocity from powertrain data using C++ with mlpack, improving perception robustness under GPS denied conditions
  - Implemented sensor drivers and IMU calibration algorithm in C++, providing accurate sensor measurements to the sensor fusion algorithm
- **System Integration**
  - Integrated perception and control algorithms in ROS2 and deployed on ARMv8 embedded Linux platform
  - Integrated ADAS system with HMI devices and Vehicle Control Unit using CAN protocol for in-house powertrain integration
  - Implemented an event handling system in C++ and Bash for ADAS nodes, integrating error logging and automatic recovery to improve system reliability
  - Optimized ADAS system and algorithms, reducing computational load on embedded platform by 10%
- **ADAS Research & Development**
  - Delivered ADAS L1 software on the in-house outboard motors through OTA update, achieving position and heading hold and omnidirectional motion control; received over 90% customer satisfaction in beta testing
  - Developed a differential steering control strategy for inboard and pod motors with control team, enabling ADAS deployment across diverse product lines
  - Collaborated with UI/UX and embedded systems teams to design HMI interfaces for ADAS system
  - Prototyped a pattern and path-following algorithm for surface vessels with control team; deployed and tested in Gazebo simulation

Suga International Holdings Limited Hong Kong SAR

Electronics Engineer Intern *Jul 2021 – Jun 2022*

- Designed PCB for USB multichannel audio mixer, integrating analog amplification with embedded control
- Implemented a DSP audio mixing algorithm on XMOS MCU for real-time audio processing

Aerosim (HK) Hong Kong SAR

Associate Engineer Intern *Jun 2020 – Apr 2021*

- Designed PCBs and STM32 firmware for aviation simulator control systems

Education

City University of Hong Kong, Department of Electrical Engineering Hong Kong SAR

BEng in Computer and Data Engineering *Sep 2018 – Feb 2023*

Related Courses: Data Engineering and Learning Systems, Modelling Techniques, Signal and Systems, Digital Signal Processing, Computer Architecture, Data Structures and Algorithms, Operating Systems

Skills

Programming Languages: C/C++, Python, Bash, MATLAB, Java, SQL
Software Tools: Git, ROS/ROS2, Gazebo, Docker, OpenCV, TensorFlow
Hardware: Altium Designer, STM32, NVIDIA Jetson, CAN protocol, SolidWorks, 3D printing, Arduino

Competitions & Projects

CityU Underwater Robotics Team (CityUUR) *Sep 2018 – Jul 2022*

- Led electronics team (∼ 6 people) for 2 years, overseeing hardware development and system integration for ROV and AUV competitions
- Designed modular electronic backplane system for underwater vehicles, improving electronic system reusability and debugging efficiency
- Designed PCB and firmware for micro ROV (<4×4 cm) for a task in MATE ROV 2019
- Implemented underwater object detection using OpenCV on Jetson Nano for AUV autonomous tasks
- Implemented pneumatic actuation for ROV manipulators using solenoid valves with embedded control
- Collaborated on 1000W 48V–16V GaN-based DC–DC buck converter research for ROV power system
- Achievements:
  - 2019 MATE ROV Competition – Explore Division - 5th place
  - 2022 MATE ROV Competition – Explore Division - 9th place
  - IEEE SAUVC (Singapore AUV Challenge) 2019 - 5th place, Innovative Engineering Prize
  - IEEE SAUVC (Singapore AUV Challenge) 2022 - 9th place

Open Underwater Research System *Jan 2021 – Jan 2022*

- Selected into CityU HK Tech 300 Start-up Programme as a Seed Fund Team (3rd Cohort, 2021); received HKD$100,000 funding for further development
- Co-designed an actuated underwater device, integrating sensors and control systems for seawater quality monitoring
- Implemented PID controller on STM32 to perform position hold in open-sea conditions
- Fine-tuned PID parameters during field testing, ensuring the performance of position hold

Flight Controller for Underwater Vehicles – Design Project *Nov 2020 – Jul 2021*

- Implemented orientation estimation using 9-axis IMU with Kalman Filter; prototyped in MATLAB and deployed on STM32
- Implemented PID controller to assist manual ROV control in Python; validated in Gazebo simulation and deployed on STM32
- Designed a PCB integrating BLDC thruster control, IMU and external depth sensors

Leadership Experience

Student tutor of Peer-Assisted Learning scheme (PALSI) at CityUHK *Jan – Dec 2021*

- Led weekly tutoring sessions for *Electronic Devices and Circuits (EE2005)* and *Java Programming and Applications (EE3206)*
- Mentored groups of up to 10 students, providing supplemental instruction and guidance on coursework

Assistant of CDNIS Summer School STEM Programme at CityUUR *May – Jul 2022*

- Collaborated to design robotics STEM courses and prepared instructional materials
- Delivered STEM classes for Grade 3–6 students, providing hands-on experience on building ROV and programming

Patents

- Pose estimation algorithm for surface vessels (co-inventor) - Filed Feb 05, 2024; Published Dec 10, 2024; **CN118168506**; Method for acquiring attitude data of water area carrier and related equipment
- Position hold algorithm for surface vessels with a single outboard motor (co-inventor) - Filed Feb 26, 2024; Published Dec 13, 2024; **CN119137557**; Method for keeping position of water area carrier based on single propeller and related equipment
- Heading hold algorithm for surface vessels with a single outboard motor (co-inventor) - Filed Feb 05, 2024; Published Aug 14, 2025; **WO2025166518**; Method for realizing direction maintenance of water vehicle on the basis of single propeller, and related device