Donald Ngo Fung IP (Donald Ngo Fung LAI)

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Experience

Software Engineer Sep. 2022 – Aug. 2024

Cornerstone Robotics Limited

- Managed **state machine** systems with **over 1,000 states** for a behavioral supervision application in **laparoscopic surgical robots**, enhancing robustness and reliability
- Developed features using **C++** and **Python** on real-time embedded Linux systems with DDS structure, including **Yocto & VxWorks**, achieving time-critical performance
- Designed and developed an in-house debugging tool using **Qt**, improving efficiency in identifying and resolving issues
- Collaborated with cross-functional teams in SDLC, utilizing **Agile**, **Waterfall**, and **Test-Driven Development** methodologies, ensuring quality deliverables and meeting deadlines
- Led the development of a new state machine in a new surgical robot, overcoming challenges in laparoscopic surgery and successfully attracting **investor funding**

MPhil Candidate and Research Assistant Oct. 2019 – Aug. 2022

The Chinese University of Hong Kong

- Led development of software and hardware prototypes for **3D reconstruction** in endoscopic procedures, securing a **new funding project**
- Implemented high-performance algorithms in **C++** and **Python** for **3D point-set processing**, integrating **sensor fusion** to ensure reliability. Used libraries like **OpenCV**, **PCL**, and **OpenGL**
- Developed anti-counterfeiting and joystick control systems for surgical robots using **ARM Cortex MCU (STM32)**, including firmware and hardware development, and implemented communication protocols like **1-Wire**, **I2C**, and **UART**, resulting in a secure and efficient control system
- Presented research at academic conferences under the mentorship of **Prof. YAM Yeung**

Research and Development Intern (Full-time) June 2017 – July 2018

ASMPT

- Developed high-precision motor systems and low-cost electromagnetic position sensors, achieving low-latency feedback and accurate control
- Developed a full-stack web app using **PHP**, **JavaScript**, and **Bootstrap** to automate the CE file system and processes, increasing efficiency by **50%**

Education

The Chinese University of Hong Kong

Master of Philosophy in Mechanical and Automation Engineering *Aug. 2020 – Aug. 2022*

- Thesis: Dual-channel Bi-directional Structured Light 3D Imaging System

The Hong Kong Polytechnic University

Bachelor of Engineering (Hons) Degree in Electronic and Information Engineering *Sept. 2014 – Sept. 2019*

Projects

Structured Light 3D Reconstruction for Endoscope | *C++, Python, QT, PCL* June 2020 – Aug. 2022

- Developed a prototype multi-channel **structured light** system, reducing measurement error from **12.3%** to **5%**
- Utilized translation of point sets, **Iterative Closest Point (ICP)**, and **Moving Least Squares (MLS)** techniques to integrate multiple point cloud data sources, producing a more complete dataset (**50% increase**)
- Designed a user-friendly **QT**-based GUI with **threading** capabilities, ensuring seamless integration and optimal performance
- Leveraged **PCL** and **OpenCV** for **point cloud reconstruction, registration, and smoothing**, ensuring high accuracy

Embedded Software for Quadruped Robot | *Embedded C++, Mbed OS RTOS* Sept. 2018 – June 2019

- Developed firmware for **ARM Cortex MCU (STM32)** for a lightweight, agile quadruped robot
- Utilized **Mbed OS RTOS framework** to ensure precise task scheduling and real-time control of robot movement with protocols like **CAN bus, I2C, and SPI**
- Integrated **IMU and distance sensors** to enhance stability and obstacle detection
- Collaborated with a multidisciplinary team to refine robot gait algorithms, resulting in improved locomotion and efficiency
- Validated system performance using lab instruments and debugging tools such as **ST-LINK** and **CAN BUS analyzer**

Publications

1. **D. N. F. Lai***, H. G. H. Chow*, K. C. Lau, L. W. Cheung, F. F. Leung, P. W. Y. Chiu, & Y. Yam. (2021). "A proposed SLP system to collect additional point cloud data with dual optical channels," *Proceedings of the International Symposium on Optical Technologies (ISOT 2021). *Equal Authorship Contribution*

2. **D. N. F. Lai**, G. H. H. Chow, K. C. Lau, L. W. Cheung, F. F. Leung, W. Y. P. Chiu, & Y. Yam. (2021). "Multiple point cloud reconstruction using dual bi-directional channel structured light system for endoscopic surgical system," *Poster presented at the Engineering Medical Innovation Summit: Medicine for the Future (EMedI Summit) 2021*

Technical Skills

Languages: C/C++, Python, C#, Java, JavaScript, PHP, SQL (MySQL), HTML/CSS
Frameworks: VxWorks, OXF, Qt, Bootstrap
Developer Tools: IBM Rational Rhapsody, CMake, Docker, Keil µVision, STM32CubeMX, Altium Designer, SolidWorks
Libraries: OpenCV, PCL, PyTorch, NumPy, Matplotlib