Kai Chuen Tan

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Professional Summary

I am a robotics engineer and enthusiast, who has more than 3 years of working experience in embedded software programming, designing mechanical systems, and industrial prototyping, with a profound interest in both computer vision and machine learning.

Education

University of California, San Diego (UCSD) — **San Diego, CA**
Master of Science in Electrical and Computer Engineering (Intelligent Systems, Robotics, and Control) — **Dec 2022**

The Ohio State University (tOSU) — **Columbus, OH**
Bachelor of Science in Mechanical Engineering — **Dec 2019**

- **Awards** : Graduated with Summa Cum Laude, Dean's List, Honors Research Distinction.
- **Thesis** : Development of Fully Autonomous and Cooperative Robotic System for Interplanetary Explorations.

Work Experience

Autonomous Vehicle Laboratory, UCSD — **San Diego, CA**
Graduate Research Assistant (Perception and Motion Planning) — **Jun 2022 – Present**

- Developed a 3D-LiDAR annotation tool with a built-in .pcd to .bin file converter for data extraction and labeling.
- Implementing a real-time motion planning algorithm for a micro-mobility vehicle in a dynamic campus environment.

Advanced Skills: Python, JavaScript, CSS, HTML, C++, Autoware, Docker, ROS, Linux, Git

Aonic (Formerly Poladrone Solutions Sdn. Bhd.) — **Cyberjaya, Malaysia**
Unmanned Aerial Vehicle (UAV) Engineer — **Sep 2020 – Aug 2021**

- Implemented a drone speed parameter estimation algorithm using kinematics equations that improved the cost-efficiency of agriculture drone pesticide spraying missions by at least 10.1 %.
- Integrated the Hall-effect turbine flowmeter and water detection sensor into the Oryctes drone ecosystem to reduce the pesticide spraying volume error to less than 1.0 %.
- Designed and built Oryctes Dual and Mist agriculture drones' accessories that increased the pesticide spraying precision for Malaysia's largest plantation companies (i.e., Sime Darby Plantation, and Genting Plantations).
- Saved 39.2% of manufacturing cost by improving Oryctes' proximity sensors and gimbal camera mountings' structural design.

Advanced Skills: C++, Python, PlatformIO, Git, Mission Planner, Ardupilot, SolidWorks, 3D-printing, Laser-cutting, GD&T

Automation and Optimization Laboratory, tOSU — **Columbus, OH**
Robotics Research Assistant — **Aug 2018 – July 2020**

- Decreased the computational cost of a heuristic-based path planning algorithm refined RRT* by 52 %.
- Saved at least 92 % of unmanned ground vehicles (UGVs) energy consumption in a rugged 3D-space exploration mission by integrating a jumping mechanism on customizable UGVs.
- Formulated multiple traveling salesman problem (mTSP) mathematically with a UGV's energy consumption model as a mixed-integer linear programming (MILP) to allocate UGV's visiting tasks efficiently.
- Reduced the weight of a UGV with a cam-follower jumping mechanism by 53 grams to increase power efficiency by designing a light and compact printed circuit board and tweaking the UGV's chassis design.

Advanced Skills: MATLAB, Python, C++, Arduino, Raspberry Pi, SolidWorks, Fritzing, 3D-printing, Laser-cutting, Machining

Projects

Autonomous Vehicle Particle Filter and Visual-Inertial SLAM (Skills: Python, OpenCV, Matplotlib, NumPy, Sci-kit Learn)

- Localized the autonomous vehicle, performed landmark mapping using the EKF, and built a 2-D occupancy grid map of the environment given the odometry, 2-D LiDAR scans, and stereo camera data by using various SLAM techniques.

Therapeutic Robotic Interactive Canine Companion Robot (TRICC) (Skills: C++, Arduino, SolidWorks, 3D-printing)

- Designed and built an interactive and lovable companion robotic pet dog with a customizable and detachable busy blanket to provide sensory stimulation and soothing effects to people with dementia by reacting to a user's petting like a real dog.

Tech Skills

Programming Languages : Python, C++, C, MATLAB, Java, JavaScript, HTML, CSS, Swift
Frameworks : OpenCV, NumPy, Matplotlib, Sci-kit Learn, Pandas, Tkinter, Flask, TensorFlow, Pytorch
Tools : ROS, Git, Docker, Jupyter Notebook, LabVIEW, Simulink, Minitab, LaTeX, Microsoft Office
Concepts : Machine Learning, Computer Vision, Robotics, Perception, Motion Planning, Big Data Analytics
CAD/Manufacturing : SolidWorks, ANSYS ADPL, Abaqus, CATIA, CNC, GD&T, Laser-cutting, 3D-printing, Machining
Relevant Courseworks : Computer Vision, Sensing and Estimation in Robotics, Healthcare Robotics, Autonomous Driving and Driver Assistance Systems, Robot Motion Planning, Programming for Data Analysis, CAD & Manufacturing

Publications

- M. Jung, K. Chuen Tan, and R. Dai, "Path Planning for a Jumping Rover Team with a Charging Station in Multi-waypoints Visiting Missions," Frontiers in Control Engineering, vol. 3, 2022.
- K. C. Tan, I. Shyu, M. Jung, C. Wan, and R. Dai, "Motion Planning and Task Allocation for A Jumping Rover Team," 2020 IEEE International Conference on Robotics and Automation (ICRA), 2020.