

Juo-Tung Chen

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Education

JOHNS HOPKINS UNIVERSITY	Baltimore, MD
M.S.E. in Robotics - Perception and Cognitive Systems Track	Aug. 2022 - May. 2024 (expected)
NATIONAL TAIWAN UNIVERSITY	Taipei, Taiwan
B.S. in Biomechatronics Engineering (GPA: 3.72/4.0)	Sept. 2017 – Jun. 2022

Skills

- **Programming language:** C/C++, Python, Matlab, L^AT_EX, HTML, CSS, Javascript
- **Software:** ROS, GIT, MoveIT, Gazebo, Docker, SolidWorks, Simulink, QT, OpenCV, MySQL, Pytorch
- **Operating system:** Linux, Windows, MacOS
- **Embedded Systems:** Raspberry Pi, Arduino, TX2, Concerto(F28M3X)

Research Experience

Johns Hopkins University, Intuitive Computing Lab	Baltimore, MD
Robotic Manipulation with AI-Powered Voice Control	Feb. 2023 – Present

- Developed a C++ ROS package utilizing MoveIt! for the Franka Panda robot arm, enabling precise pick and place operations
- Implemented an Alexa Skill using Flask-Ask to facilitate voice-controlled interaction with the Panda robot
- Created an innovative end-user programming environment by integrating Alexa, GPT API, and the Panda robot arm

National Taiwan University, Robots and Medical Mechatronics Lab	Taipei, Taiwan
Collaborative Tea-Harvesting Robot	Jul. 2019 – Aug. 2021

- Created an intelligent vehicle capable of carrying tea harvesting tool with a side-by-side walking feature and object avoidance to pluck tea with a human worker collaboratively
- Devised path planning with Reed & Shepp curve to perform autonomous turns between tea trees
- Performed object avoidance and SLAM using Lidar through Robot Operating System (ROS)

Intelligent Sensing and Precise Cultivating System in Greenhouses

- Led a team of 5 undergraduate students to conduct research activities and organized tasks for team members
- Utilized SolidWorks to design a 5 DoF robotic arm equipped with a Chlorophyll Fluorescence Imaging sensor to automatically detect water stress within a tomato plant
- Simulated kinematics and motion planning for robotic arm with Simulink and Rviz

Internship Experience

Coretronics Intelligent Robotics Corporation	Hsinchu, Taiwan
R&D Intern in AI Team	Jul. – Sept. 2020

- Implemented system identification using Matlab and constructed a 2D simulation for autonomous forklift using Simulink, QT, C++, and OpenCV
- Performed research on Convex Elastic Smoothing algorithm and developed a Double Continuous Curvature path planning algorithm with an error < 3%

Competitions

Taoyuan ROS summer school: 3rd place in the advanced robot competition	Aug. 2020
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- Implemented SLAM and path planning algorithm on an ADLink NeuronBot (Omni-directional mobile robot) with ROS/ROS2 and Rviz
- Conducted object recognition using OpenVino with 97% of training accuracy

Projects

Course Projects at JHU

Baltimore, MD

Mixed reality pick and place

Dec. 2022 – Jan. 2023

- Developed an augmented reality (AR) pick and place system using Microsoft HoloLens and UR5 robot arm, enabling precise control and interaction with virtual objects for seamless task execution
- Created a ROS2 package to facilitate the movement of UR5 robot arm using MoveIt, ensuring smooth and object avoiding motion planning for pick and place operations
- Implemented a custom pick and place action library for UR5, based on the developed MoveIt package

Motion Planning for Autonomous Parallel Parking

Dec. 2022 – Jan. 2023

- Implemented Direct Collocation method with Python to generate trajectories and control inputs with minimum control effort for autonomous parallel parking
- Incorporated obstacle avoidance feature by designing an algorithm calculating the minimum distance between the car's corner and the obstacles, and integrated it into inequality constraints
- Designed and integrated an obstacle avoidance algorithm through incorporating minimum distance between the car and obstacles into inequality constraints
- Developed simulation environment with interactive user interface and 8 selectable parking slots

Adversarial Attacks and Defensive Distillation for Neural Network

Oct. – Nov. 2022

- Implemented GoogLeNet using Pytorch and trained on CIFAR-10 dataset with an accuracy of 92.68 %
- Applied three adversarial attacks including Fast Gradient Sign Method (FGSM), Noise, and Semantic attack
- Introduced Defensive-Distillation as a defense mechanism against FGSM attack and successfully retained an accuracy of 89.13 % instead of 28.15 % without defense

Structure From Motion

Oct. – Nov. 2022

- Implemented the Tomasi-Kanade factorization approach using Matlab to reconstruct a 3D point cloud of the object from video datasets
- Utilized KLT("Good Features to Track") tracker to track prominent features across video frames

Course Projects at NTU

Taipei, Taiwan

Adaptive Control System

Mar. – Jul. 2021

- Collaborated with a team of 3 to implement various adaptive laws and Neural network algorithms to estimate slippage parameters of a tracked mobile robot
- Constructed simulation models and animation using Simulink and python

Digital Control System

Mar. – Jul. 2021

- Executed system identification to estimate transfer function of motors on a tracked mobile robot
- Analyzed motor transfer function using Matlab; performed Pole placement to design digital PI controller
- Implemented digital controller on actuator to meet controller design specifications on a track mobile robot and improved trajectory tracking performance by 73 %

Mechatronics and System Design

Sept. 2020 – Feb. 2021

- Collaborated with 2 teammates to develop an app to facilitate selection of a ball with specified color
- Constructed a database by MySQL to send a delivery request for a mobile delivery robot to carry the target ball to designated destination while avoiding objects

Robot Vision

Mar. – Jul. 2020

- Integrated computer vision and image processing techniques with OpenCV to track motion of a human hand and replicate it on a robotic hand
- Collaborated with a team of 4 and 3D printed an open source bio-mimetic humanoid robot hand to execute various finger motions