

Changjin Wang

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Personal website: <https://wangchangjin123.github.io/cv/> (Recommended for more detailed video info)

Personal Statement

My research has primarily focused on robot perception and control technology and I have a solid theoretical foundation in these fields. I am good at approaching scientific problems with a determination to uncover every detail and excel at discovering bottlenecks in engineering systems. I am a full-stack robot engineer thriving on embracing new challenges!

Education & Work Background

- ❖ 2020.7-now: Robot algorithm engineer, Central Research Laboratories, **Huawei Technology, Ltd.** (Annual awards, A/B+/A, TOP 15%)
- ❖ 2017.9-2020.6: **M.S.** in Bionic robot controlling. **Beijing Institute of Technology**. Rank: 4/30 GPA: 3.7/4
- ❖ 2017.1-2017.6: Visiting student, **The University of Auckland**
- ❖ 2013.9-2017.6: **B.S.** in Mechatronics Engineering, **Beijing Institute of Technology**. Rank:13/62 GPA: 3.5/4

Publications

- ❖ An integrated two-pose calibration method for estimating head-eye parameters of a robotic bionic eye[J]. IEEE Transactions on Instrumentation and Measurement, 2019, 69(4): 1664-1672. Xiaopeng Chen, **Changjin Wang**, Weizhong Zhang, et al. (2nd Author, the first Author is my tutor)
- ❖ The Design and Development of an Anthropomorphic Worm-Gear Driven Robotic Hand: BIT-JOCKO. 2019 IEEE 4th International Conference on Advanced Robotics and Mechatronics (ICARM). **Changjin Wang**, Yao Sun, Jiafeng Xu, etc. Best Paper Finalist

Honors and Awards

- ❖ Scholarship: National Scholarship, First-class Academic Scholarship for Graduate Students, National Motivational Scholarship, Tang Nanjun Scholarship, SMC Scholarship
- ❖ Awards: First Prize in the National College Student "Challenge Cup" Competition
First Prize in the National Aerospace Model Competition
Second Prize in the National College Student Energy Saving Competition
Top Ten Projects in the National College Student Innovation and Entrepreneurship Champion
Two Huawei Annuals A Award (Top 15%), One Huawei Annuals B+

Skills

Coding: C++, Python, MATLAB

Hardware: good at embed-system and mechanical design, besides, I have a set of my own highly compact FOC controller which supports dual encoder 3-ring control including hollow shaft encoder with various feed-forward and GUI interfaces, familiar with AI NPU infer.

Software: Solidworks, Matlab, QT, Altium Designer

Algorithm: Good at robotic arm lower-level kinematics, floating base dynamics, and trajectory planning, with self-written libraries. I also have strong theoretical derivation ability and the ability to insight into the essence and bottleneck of problems, familiar with optimal control and non-linear MPC.

Research & Project Experience

❖ Industrial Projects: Huawei Technology, Robot Control Algorithm Engineer (2020.7-now, publication-limited)

➤ Designed and developed of Hybrid 18-DOF Robot

This system utilizes a nonlinear solver to achieve 18-DOF full-body Jacobian null-space control and whole-body floating-based kinematics and dynamics for obstacle crossing.

➤ Developed a revolutionizing Point-Mass Model Implementation for 4WIS Robot

The controller automatically decomposes any v_x, v_y, ω_z commands within a two-dimensional plane into a point-mass model, enabling the robot to follow any trajectory within maximum velocity with minimal energy consumption, enhancing motion efficiency and energy utilization just by one optimal equation.

➤ Developed an innovative Low-cost, Low-inertia, Low-mass Force-controlled Robotic Arm

I achieved it by discarding the MoveIt architecture and independently write a real-time, high-performance, lightweight robot library. This 5kg arm can reach 920mm and carry a 2.5kg payload with approximately 1mm repeatability which offering a cost-effective solution suitable for mobile robot applications.

❖ Research projects: Beijing Institute of Technology (postgraduate stage, 2017.7-2020.7)

➤ Developing High-dynamic Bionic-eye Attitude Stabilization Algorithm

In this work I proposed a stabilization algorithm based on gravity compensation and attitude disturbance observation. This algorithm achieves disturbance rejection above 5Hz while maintaining end-effector stability within 0.5° .

➤ Developed an Online Bionic Eye External Parameter Calibration Algorithm

In this work I designed a method for offline calibration and online real-time computation of binocular external parameters was proposed. This allows for accurate point location in the overlapping field of view and depth information recovery even during motion

➤ Visionary Active 3D Exploration and Reconstruction for Robotic Bionic-eye

In this work I innovated an algorithm for Active SLAM using bionic eyes. This strategy enables efficient full-angle 3D reconstruction and 2D map creation in completely new environments with a one-click start and full autonomy.

❖ Research projects: Beijing Institute of Technology (undergraduate stage, 2013.7-2017.7)

➤ Developed a 20 DOF self-locking dexterous hand

The worm gear is used to realize the self-locking of the dexterous hand power-off structure, which can theoretically bear the weight within the allowable range of the structural strength. It adopts a modular knuckle design, a highly anthropomorphic design, and has 20 degrees of freedom. It also increases the degree of freedom of the palm side swing, increasing the palm grasping space by 30%.

➤ Developed an EtherCAT-based PMSM driver for the UR robot.

This FOC driver is developed based on the Infineon XMC4800 EtherCAT kit and integrated high voltage MOSFET driver specially designed for UR-like robot arm additionally. A self-tuned PID algorithm is developed based on Ziegler-Nichols. Simulation is verified successfully.

Personal Interests & Vision

I enjoy constantly challenging myself in both learning and work, especially when faced with difficult problems. Apart from academics and work, I spend my leisure time playing the piano and badminton, seeking a work-life balance. In the future, I aspire to become an outstanding researcher in robotics, aiming to make breakthroughs in the field of intelligent robotic operation.