

SHUDA DONG

Curriculum Vitae

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RESEARCH INTERESTS & GOAL

My primary research interests encompass the theoretical analysis and systematic application of **robotics**, focusing on **state estimation**, **electrical system design**, **nonlinear control** and **artificial intelligent** methods. I aim to integrate these areas to develop **intelligent solutions guided by control theory philosophies**, advancing the field of robotics.

EDUCATION

🏛️ Sichuan University 🎓 Bachelor Automation	09/2018 - 06/2022
College of Electrical Engineering	📍 Chengdu, China
Comprehensive Ranking	4/117
Overall GPA	3.48/4.00
🏛️ South China University of Technology 🎓 Master Mechanical Engineering	09/2022 - 06/2025
Shien-Ming Wu School of Intelligent Engineering	📍 Guangzhou, China
Course Ranking	8/38
Average Score	83.44/100

PUBLICATION & PATENT

A Compact and Robust 6-DoF Pose Tracking System Using Magnetic-Inertial Sensors and a Single Uniaxial Electromagnetic Coil	1/2024
Shuda Dong and Heng Wang <i>IEEE Sensors Journal</i> <i>First Author</i>	
A Virtual Ultrasonography Simulator for Skill Training Using Magnetic-Inertial Probe Tracking	6/2023
Heng Wang, Shuda Dong, Qi Yang, Jiancheng Han, Ze'an He, Yihua He and Shuangyi Wang <i>IEEE/ASME Transactions on Mechatronics</i> <i>Co-first Author</i>	
On Ambiguity in 6-DoF Electromagnetic Pose Estimation Systems with Dipole Sources	7/2024
Xinlei Zhang, Shuda Dong, and Heng Wang <i>The International Journal of Robotics Research</i> (under the second-round review) <i>Co-first Author</i>	
Active 6-DoF Electromagnetic Pose Tracking Using Orientation Control of the Magnetic Source	12/2023
Yile Shen, Shuda Dong, Dekang Liu, Kaixiang Zhang and Heng Wang <i>IEEE International Conference on Robotics and Biomimetics (ROBIO)</i> <i>Co-first Author</i>	
Virtual simulation system and method for medical ultrasonic operation training	3/2023
Heng Wang, Shuangyi Wang, Suqi Liu, Shuda Dong, Xinlei Zhang CN Patent Pending No.CN116312122A	

SELECTED COMPETITION AWARDS

RoboMaster University Championship 2021	8/2021
National Second Prize, Top 16	
RoboMaster University League 2021	8/2021
First Prize in Engineering Robot Mining, Top 5 in Southern China	
The 16th National College Student Intelligent Car Competition	7/2021
Second Prize in Baidu Intelligent Traffic Group, Top 20%	
2020 RoboCup China Open	10/2020
Third Prize in Small Size Robot League, Obstacle Avoidance Challenge	

RESEARCH EXPERIENCE

Magnetic Medical Robotics Lab, SCUT

10/2021-Present

Graduate Student, advised by Prof. Heng Wang 

6-DoF Magnetic-Inertial Pose Tracking System | *Research Leader*

- **Pose Tracking System Design**

Contribution:

- * Developed the compact 6-DoF pose tracking system only using a magnetic-inertial sensor and a uniaxial coil.
- * Proposed an ON-OFF switching control for the electromagnetic coil to reject magnetic disturbances.
- * Designed and implemented EKF framework for sensor fusion and state estimation
- * Conducted extensive experiments to validate the tracking and disturbance rejection performance of the system

Outcome:

- * Achieved millimeter-level accuracy in 6-DoF pose estimation, robust against magnetic disturbances.
- * Published in the **IEEE Sensors Journal**.

- **System Application in Ultrasonography Simulator for Skill Training**

Contribution:

- * Integrated the 6-DoF pose tracking system into the virtual ultrasonography simulator for skill training
- * Conducted experiments to validate the tracking performance moving along a typical scanning trajectory
- * Conducted experiments to validate the interactive performance of the simulator

Outcome:

- * Developed a simulator that provides an immersive training experience for quick ultrasound skill acquirement.
- * Published in the **IEEE/ASME Transactions on Mechatronics**.
- * Applied for one **CN patent**.

- **System Optimization Using Active Sensing**

Contribution:

- * Analyzed distribution of magnetic sensitivity relative to magnet direction
- * Developed an active 6-DoF electromagnetic tracking system to maintain high accuracy
- * Conducted simulations and experiments to validate the improvements in tracking performance of the active tracking system.

Outcome:

- * Developed an active pose tracking system that expands the workspace and enhances accuracy.
- * Presented at **ROBIO 2023**.
- * Journal article in preparation.

Multi-Source Electromagnetic Pose Tracking System | *Research Leader*

- **On Ambiguity in 6-DoF Magnetic Pose Estimation**

Contribution:

- * Systematized the framework to analyze the ambiguity issue in magnetic pose estimation system.
- * Proposed an optimal minimum magnetic source design for a 6-DoF pose tracking system without ambiguity.
- * Conducted experiments to validate the tracking performance of the proposed system on a continuum robot.

Outcome:

- * Extended the research frontier by defining and addressing ambiguity issues in magnetic pose tracking systems.
- * Submitted a manuscript to **International Journal of Robotics Research**, currently under second-round review.

- **6-DoF Robust Electromagnetic Pose Tracking System using Error-State Kalman Filter**

Contribution:

- * Developed a robust electromagnetic pose tracking system addressing quaternion norm violation issue.
- * Conduct simulations and experiments to validate the effectiveness error-state Kalman filter in electromagnetic pose tracking system

Outcome:

- * Completed a journal article manuscript.

SKILLS

Languages: Mandarin (Native), English (TOFEL: 92/120)

Programming: MATLAB & Simulink, Python, C, C++, Linux Shell

Others: Altium Designer, SolidWorks, Embedded System Development, Multisim, Photo & Video Editing, Markdown