

Ran Hao

Robotics Researcher, Engineer

☎ (+1) 216-925-8383

✉ rxh349@case.edu

🌐 www.ranhaohr.com

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Research Interests

I'm currently a research assistant in Medical Robotics and Computer Integrated Surgery (MERCIS) Laboratory, Case Western Reserve University. My research interests includes Medical robotics, Haptics, Motion planning, SLAM.

Education

2018–Present **Case Western Reserve University**

Ph.D. Candidate in Electrical Engineering

Advisor: M. Cenk Cavusoglu.

Aug 2017 **Case Western Reserve University**

M.S. in Electrical Engineering

Thesis: Vision-based Surgical Tool Pose Estimation for Da Vinci Robotic System

Advisor: M. Cenk Cavusoglu.

July 2015 **Beihang University**

B.Eng. in Quality and Reliability Engineering

Thesis: Design and Verification of a Mutl-Dimentional Tilt-Rotor Quadrotor.

Research Experience

2018–Present **Contact Stability and Safety Analysis and Control of a MRI-Guided Robotic Catheter under Cardiac Surface Motion and Blood Flow**

Case Western Reserve University

Advisor: M. Cenk Cavusoglu

Publications: ICRA'20 [1], IROS'20 [2], J. Dyn. Sys., Meas., Control.'21 [3] [4] .

Summer 2019 **Summer Research Intern**

Path Robotics, Columbus, OH

Designed a constraint optimal motion planning algorithm for welding robots.

2017-2018 **Distributed Real-time Systems**

Vanderbilt University

Advisor: Taylor Johnson.

2016–2017 **Visual-Based Surgical Robot Tool Tracking for Da Vinci Robotic Surgery System**

Case Western Reserve University

Advisor: M. Cenk Cavusoglu

Publications: IROS'18 [5], ICRA'18 [6].

2016–2017 **Hand-Eye Calibration of Da Vinci Robotic Surgery System**

Case Western Reserve University

Advisor: M. Cenk Cavusoglu

Publications: T-ASE'20 [7].

2013–2014 **Multi-object Optimization based on Pigeon Inspired Optimization Algorithm**
Beihang University
Advisor: Haibin Duan
Publications: CGNCC'14 [8].

Publications

- [1] **R. Hao**, T. Greigarn, and M. C. Çavuşoğlu, "Contact stability analysis of magnetically-actuated robotic catheter under surface motion," in *2020 IEEE International Conference on Robotics and Automation (ICRA)*. IEEE, 2020, pp. 4455–4462.
- [2] **R. Hao**, N. L. Poirot, and M. C. Cavusoglu, "Analysis of contact stability and contact safety of a robotic intravascular cardiac catheter under blood flow disturbances," in *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2020)*, 2020.
- [3] **R. Hao**, E. E. Tuna, and M. C. Çavuşoğlu, "Contact stability and contact safety of a magnetic resonance imaging-guided robotic catheter under heart surface motion," *ASME Journal of Dynamic Systems, Measurement, and Control*, 2021.
- [4] **R. Hao** and M. C. Cavusoglu, "A probabilistic approach for contact stability and contact safety analysis of robotic intracardiac catheter," *ASME Journal of Dynamic Systems, Measurement, and Control*, 2021.
- [5] **R. Hao**, O. Özgüner, and M. C. Çavuşoğlu, "Vision-based surgical tool pose estimation for the da vinci robotic surgical system," in *2018 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*. IEEE, 2018, pp. 1298–1305.
- [6] O. Özgüner, **R. Hao**, R. C. Jackson, T. Shkurti, W. Newman, and M. C. Cavusoglu, "Three-dimensional surgical needle localization and tracking using stereo endoscopic image streams," in *2018 IEEE international conference on robotics and automation (ICRA)*. IEEE, 2018, pp. 6617–6624.
- [7] O. Özgüner, T. Shkurti, S. Huang, **R. Hao**, R. C. Jackson, W. S. Newman, and M. C. Çavuşoğlu, "Camera-robot calibration for the da vinci robotic surgery system," *IEEE Transactions on Automation Science and Engineering*, 2020.
- [8] **R. Hao**, D. Luo, and H. Duan, "Multiple uavs mission assignment based on modified pigeon-inspired optimization algorithm," in *Proceedings of 2014 IEEE Chinese Guidance, Navigation and Control Conference (Best Paper Finalist)*.

Professional Experience

Reviews IEEE International Conference on Robotics and Automation (ICRA)
IEEE Transactions on Mechatronics

Teaching Assistance

Spring 2020 EECS499 Algorithmic Robotics (*Curriculum Designer*)
Fall 2019 EECS489 Robotics I
Spring 2019 EECS305 Control Engineering
Fall 2018/
2020 EECS484 Computational Intelligence I

Skills

C++/C, Robot Operating System (ROS), MATLAB, Python, OpenCV, OpenGL

References

M. Cenk Cavusoglu

Nord Professor of Engineering in Dept. of Electrical, Computer, and Systems Engineering

Case Western Reserve University

E-mail: mcc14@case.edu.

Wyatt Newman

Professor of Engineering in Dept. of Electrical, Computer, and Systems Engineering

Case Western Reserve University

E-mail: wsn@case.edu .

Orhan Ozguner

Assistant Professor of Engineering in Dept. of Computer and Data Sciences

Case Western Reserve University

E-mail: oxo31@case.edu.