

# 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, Motion planning, Haptics, 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.*

## 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].

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 [3], ICRA'18 [4].

2016–2017 **Hand-Eye Calibration of Da Vinci Robotic Surgery System**  
*Case Western Reserve University*  
Advisor: M. Cenk Cavusoglu  
Publications: T-ASE'20 [5].

2013–2014 **Multi-object Optimization based on Pigeon Inspired Optimization Algorithm**  
Beihang University  
Advisor: Haibin Duan  
Publications: CGNCC'14 [6].

## Publications

- [1] **R. Hao**, T. Greigarn, and M. C. Çavuşoğlu, "Contact stability analysis of magnetically-actuated robotic catheter under surface motion," in *IEEE International Conference on Robotics and Automation (ICRA)*, 2020.
- [2] **R. Hao**, N. L. Poirot, and M. C. Çavuşoğlu, "Analysis of contact stability and contact safety of a robotic intravascular cardiac catheter under blood flow disturbances," in *2020 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2020.
- [3] **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.
- [4] 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.
- [5] 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.
- [6] **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 EECS484 Computational Intelligence I

## Skills

C++/C, Robot Operating System (ROS), 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](mailto: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](mailto:wsn@case.edu) .

**Orhan Ozyguner**

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

Case Western Reserve University

E-mail: [oxo31@case.edu](mailto:oxo31@case.edu).