Ran Hao

Robotics Researcher, Engineer

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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. Candicate 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].

Summer 2019 **Summer Research Intern**
Path Robotics, Columbus, OH
Designed a constraint optimal motion planning algorithm for wielding 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 [4], ICRA'18 [5].

2016–2017 **Hand-Eye Calibration of Da Vinci Robotic Surgery System**
Case Western Reserve University
Advisor: M. Cenk Cavusoglu
Publications: T-ASE'20 [6].

2013–2014 **Multi-object Optimization based on Pigeon Inspired Optimization Algorithm**
Beihang University
Advisor: Haibin Duan
Publications: CGNCC'14 [7].

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**, 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.

[5] 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.

[6] 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.

[7] **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
2020

Skills

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

References

M. Cenk Cavusoglu
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Case Western Reserve University
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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.