Gao Huxin

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● EDUCATION BACKGROUND

01/2019-01/2023 **National University of Singapore**
PhD in Biomedical Engineering
CAP: **4.70/5.0**

09/2014-06/2018 **Wuhan University**
BEng in Mechanical Engineering
GPA: **3.75/4.0** Ranking: **3/148**

● RESEARCH INTEREST

Surgical robotics, Robotic simulation, AI application in surgical robot, Autonomous control

● HONORS & AWARDS

11/2021 Silver Award in EMEDIC GLOBAL 2021 (Project: Skullbot, Teamleader)
11/2021 Best Presentation Award in EMEDIC GLOBAL 2021 (Project: Skullbot, Teamleader)
09/2018 Excellent Graduate Thesis of Wuhan University
05/2018 Excellent Graduate of Wuhan University

● RESEARCH EXPERIENCE

06/2020-05/2022 **Gastrointestinal Endoscopic Surgical Robot (National Key R&D Program of China)**
1. Design a modular flexible manipulator system with variable stiffness
2. Analyze robotic kinematics and model the stiffness

12/2020-05/2022 **Surgical Action-driven Visual Attention for Autonomous Endoscope Control**
1. Obtain visual attention point on surgical video combining surgical action
2. Visual servoing control for daVinci System using surgical action-driven attention

06/2019-12/2021 **AI Application in Brain Intervention Robot**
1. Preoperative motion planning (RCM recommendation) using deep reinforcement learning
2. Intraoperative cable-driven robot control

● RESEARCH PUBLICATIONS

Journal

[1] **H. Gao**, X. Yang, X. Xiao, X. Zhu, T. Zhang, C. Hou, H. Liu, Max Q.-H. Meng, L. Sun, X. Zuo, Y. Li and H. Ren, "Transendoscopic flexible parallel continuum robotic mechanism for bimanual endoscopic submucosal dissection," **The International Journal of Robotics Research (IJRR)**, 2023.

[2] X. Yang, **H. Gao**, S. Fu, R. Ji, C. Hou, H. Liu, N. Luan, H. Ren, L. Sun, J. Yang, Z. Zhou, X. Yang, L. Sun, Y. Li, and X. Zuo, "A novel miniature transendoscopic telerobotic system for endoscopic submucosal dissection," **Gastrointestinal Endoscopy (GIE)**, 2023.

[3] **H. Gao**, R. Hao, X. Yang, C. Li, Z. Zhang, X. Zuo, Y. Li and H. Ren, "Modeling and compensation of stiffness-dependent hysteresis for stiffness-tunable tendon-sheath mechanism in flexible endoscopic robots," **IEEE Transactions on Industrial Electronics (TIE)**, 2023.

[4] **H. Gao**, W. Fan, L. Qiu, X. Yang, Z. Li, X. Zuo, Y. Li, M.Q.Meng and H. Ren, "SAVAnet: Surgical action-driven visual attention network for autonomous endoscope control," **IEEE Transactions on Automation Science & Engineering (T-ASE)**, 2022.

[5] L. Zhang, K.S. Kumar, H. Hao, C. J. Cai, H. He, **H. Gao**, S. Yue, C. Li, R.C. Seet, H. Ren and J. Ouyang, "Fully organic compliant dry electrodes self-adhesive to skin for long-term motion-robust epidermal biopotential monitoring," **Nature Communication**, 2020.

[6] Z. Yi, **H. Gao**, X. Ji, S.Y. Chong, Y. Mao, B. Luo, C. Shen, S. Han, J.W. Wang, S. Jung, P. Shi, H. Ren and X. Liu, "Mapping drug-induced neuropathy through in-situ motor protein tracking and machine learning," **Journal of the American Chemical Society** (IF: 14.612), 2021.

[7] X. Xiao, **H. Gao**, C. Li, L. Qiu, K. S. Kumar, C. J. Cai, B. S. Bhola, N. K. K. King, and H. Ren, "Portable body-attached positioning mechanism towards robotic needle intervention," **IEEE/ASME Transactions on Mechatronics**, vol. 25, pp. 1105–1116, April 2020.

[8] X. Yang, **H. Gao**, J. Chen, C. Hou, Z. Zhou, R. Ji, H. Liu, H. Ren, Li. Sun, X. Yang, Y. Li and X. Zuo, "Development and primary evaluation of a digestive endoscopy minimally invasive surgical robot system in endoscopic submucosal dissection: an ex vivo, feasibility study," **Chinese Journal of Digestive Endoscopy**, 2022.

[9] L. Qiu, J. Cheng, **H. Gao**, W. Xiong, and H. Ren, "Federated semi-supervised learning for medical image segmentation via pseudo-label denoising," **IEEE Journal of Biomedical and Health Informatics (JBHI)**, 2023.

[10] S. Su, S. Yuan, M. Xu, **H. Gao**, X. Yang, and H. Ren, "AMagPoseNet: Real-time 6-DoF magnet pose estimation by dual-domain few-shot learning from prior model," **IEEE Transactions on Industrial Informatics (TII)**, 2023.

[11] C. Li, Y. Yan, X. Xiao, X. Gu, **H. Gao**, X. Duan, X. Zuo, Y. Li and H. Ren, "A miniature manipulator with variable stiffness towards minimally invasive transluminal endoscopic surgery," **IEEE Robotics and Automation Letters**, 2021.

[12] B.S. Yeow, H. Yang, M.S. Kalairaj, **H. Gao**, C.J. Cai, S. Xu, P. Chen and H. Ren, "Deployable serial and parallel structures by untethered magnetic deformations of programmable domain folding and cutting," **Advanced Materials Technologies**, 2021.

Conference

[1] **H. Gao**, Z. Zhang, C. Li, X. Xiao, L. Qiu, X. Yang, R. Hao, X. Zuo, Y. Li and H. Ren, "GESRsim: Gastrointestinal endoscopic surgical robot simulator," in 2022 **IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)**, 2022.

[2] **H. Gao**, X. Xiao, L. Qiu, M.Q. Meng, N.K.K. King and H. Ren, "Remote-center-of-motion recommendation toward brain needle intervention using deep reinforcement learning," in 2021 **IEEE International Conference on Robotics and Automation (ICRA)**, 2021.

[3] X. Xiao, S. Xu, C. Li, X. Gu, **H Gao**, M.Q.Meng and H. Ren, "Magnetically-connected modular reconfigurable mini-robotic system with bilateral isokinematic mapping and fast on-site assembly towards minimally invasive procedures," in 2021 **IEEE International Conference on Robotics and Automation (ICRA)**, 2021.

Workshop

[1] **H. Gao**, X. Xiao, X. Yang, T. Zhang, X. Zuo, Y. Li and H. Ren, "A miniature 3-DoF flexible parallel robotic wrist using NiTi wires for gastrointestinal endoscopic surgery," in 2022 **IEEE International Conference on Robotics and Automation (ICRA) workshop** – Frontiers of Endoluminal Intervention: Clinical opportunities and technical challenges, 2022.

Patents

[1] A measuring device and a measuring method to positioning repeatability and dynamic response for the miniature robotic arm. (Chinese patent, filed).

[2] A scoring method and a scoring device of fully automatic abdominal wall withdrawal reflex. (Chinese patent, filed).

[3] A soft robot and control strategy for the movement of the concentric tubes. (Chinese patent, filed).

● RESEARCH SERVICE

Journal: TII, TASE, Journal of Robotics, Frontiers of Mechanical Engineering, Biomimetic Intelligence and Robotics

Conference: ICRA, IROS, ROBIO, ICRAM

● SKILLS

Robotic Software: Autodesk CAD, SolidWorks, ROS, V-rep, Gazebo

Programming: Python, Matlab, Lua, C++, C

Machine Learning Architecture: Pytorch, Tensorflow, Matlab AI toolbox, Spinningup, Baseline