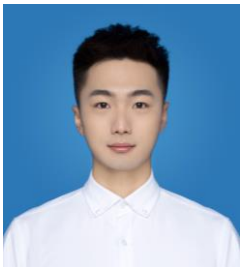

Shuangquan Zou

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Education

2014.09-2018.06	**Shenyang Jianzhu University**	**Automation**	**Bachelor**

GPA: 91.71/100 **Ranking:** 1/132 for consecutive seven semesters

Obtained the only recommended postgraduate quota for the entire major

Recommended postgraduate offer: □Tongji University □Tianjin University □Northeastern University ☑ Harbin Institute of Technology

2018.09-2020.06	**Harbin Institute of Technology (HIT)**	**Control Engineering**	**Master**

GPA: 87.98/100 **Ranking:** 3/40 Obtained the recommended doctorate quota

2020.09-prensent	**HIT**	**Control Science and Engineering**	**Ph.D candidate**

Awards

Ph.D:

Engineering Fund (2020-present)

Master:

National Scholarship (2019)
School Merit Student (2020)
Outstanding Graduates Awards (2020)
The First Prize Scholarship (2020)

Bachelor:

National Scholarship (2016)
Provincial Government Scholarship (2015)
Mayor Scholarship (2017)
The First Prize Scholarship*7 (2014-2018)
Academic Excellence Scholarship*7 (2014-2018)
Excellent Graduation Thesis (2018)
China Telecom Scholarship (2018)
Provincial Outstanding Graduates Awards (2018)
Presidential Scholarship*2 (2016, 2017)
School Outstanding Graduates Awards (2018)
School Merit Student (2015)
Volunteer Advanced Individual (2015)

Publications

1. **Zou S**, Lv Y*, Qi J, et al. A deep neural network approach for accurate 3D shape estimation of soft manipulator with vision correction [J]//SENSORS AND ACTUATORS A-PHYSICAL, 2022:113692. (**SCI**)
2. **Zou S**, Lv Y*, Guan Q, et al. A real-time 3D centerline estimation framework for multi-section soft manipulator based on stereo vision [J]//Control Engineering and Applied Informatics,2022,24(2):46-56. (**SCI**)
3. 邹双全,吕跃勇*,管清华,刘立武,马广富.基于 SOM 算法的软体机械臂三维形状实时感知[J]//哈尔滨工业大学学报. (**EI**,已录用)

   Zou S, Lv Y*, Guan Q, et al. Real-time 3D shape recognition for soft manipulator based on SOM algorithm [J]//Journal of Harbin Institute of Technology. (EI, Accepted)
4. Lv Y*, **Zou S**, Meng F, et al. A shape detection system and method for soft manipulator [P] CN109955234b, 2021-06-15. (**China Invention Patent**)
5. **Zou S**, Lv Y*, Man Y, et al. Design and implement of shape detection for the soft manipulator[C]//2020 39th Chinese Control Conference (CCC). IEEE, 2020: 3972-3977. (**EI**)
6. **Zou S**, Lv Y*, Zhao L, et al. A novel shape detection method for continuum soft manipulator based on cable encoders[C]//2019 Chinese Control Conference (CCC). IEEE, 2019: 4709-4714. (**EI**)
7. **Zou S**, Yan H, Zhang L. Reliable Static Output Feedback Guaranteed Cost Control for Uncertain Systems with Time-Delay[C]//Chinese Intelligent Automation Conference. Springer, Singapore, 2017: 407-413. (**EI**)

Research Experiences

1. **Project: Design and manufacture of the prototype**
   Student Leader *Supervisor: Prof. Guangfu Ma (Group Leader)* *09.2018-2019.06*
   - Investigated the materials and components required for the prototype of the soft manipulator, and the following materials were finally determined through referenced paper and numerous performance testing experiments.
   - Built the entire experimental platform, including the pneumatic platform and the electronic control platform, and the selection and debugging of each equipment is the basis for the following research work.
   - Learned the SOLIDWORKS to draw the draft of the baseplate, rigid frame and other components for the prototype, and printed them out with 3D printing technology, so that I can repair and adjust the components by myself in the future
2. **Project: Constant curvature 3D shape estimation based on joint information**
   Student Leader *Supervisor: Prof. Guangfu Ma (Group Leader)* *09.2019-06.2020*
   - Proposed a novel method to detect the 3D shape of soft continuum manipulator based on constant curvature model
   - Established a distributed sensor network and programed STM32 to read the sensor data and transmit it to the workstation through wireless Bluetooth module. (Keil)
   - Set the serial communication in the simulation environment, and developed the piecewise constant curvature kinematics model. The 3D shape of the soft manipulator is solved through the received joint data. (MATLAB)
   - Extended the kinematic model to the multi-section soft manipulator, and performed the shape detection experiment.
3. **Project: Real-time 3D shape reconstruction using machine vision**
   Student Leader *Supervisor: Prof. Guangfu Ma&& Prof. Jinsong Leng* *09.2020-06.2021*
   - Proposed a high-precision 3D shape estimation for soft manipulator using vision
   - Built a program frame for the ZED camera to read real-time image data in Pycharm, and programed the machine vision algorithm for preprocessing (including HSV conversion, binarization, filtering and morphological processing) and completed the contour extraction. (OpenCV, Python)
   - Used SOM algorithm to cluster the 2D centerline of the extracted contour data. Compared with other machine learning algorithms (such as K + + means algorithm, competitive learning algorithm) and thinning algorithm, the experiments showed that SOM algorithm is more suitable for this research work.
   - Proposed a numerical method is to reconstruct the centerline, and the accuracy and verified real-time performance of the whole framework
4. **Project: A deep neural network approach for accurate 3D shape estimation with vision correction**
   Student Leader *Supervisor: Prof. Guangfu Ma* *09.2021-01.2022*
   - Proposed a DNN approach to accurately estimate the 3D shape of the soft manipulator in real time, which integrates traditional sensing, machine vision, and deep learning.
   - Conducted experiments to analyze that the constant curvature kinematics method can only roughly estimate the shape of the soft manipulator, while the visual detection method is too sensitive to the environment and self- occlusion.
   - Created a dataset through extensive experiments and trained a deep neural network to construct a nonlinear relationship between joint information and visual center points. (Pytorch)
   - Conducted the error evaluation for the trained DNN on the test set, and performed a real-time bending deformation experiment to suggest the DNN approach can accurately measure 3D shape for soft manipulator via length information in real time.
5. **Project: Design and closed-loop experimental verification of a single-variable control algorithm**
   Student Leader *Supervisor: Prof. Guangfu Ma (Group Leader)* *03.2022-present*
   - Proposed a data-driven control algorithm to control the bending angle of the soft manipulator through the design of a single variable controller.
   - Used the vision sensor to obtain the end position in real time, and adopted the inverse kinematics model to solve the current bending angle, which forms an error with the expected bending angle, and further drives the controller to change the air pressure value.
   - Designed PID and model free adaptive controllers (MFAC), which do not depend on the accurate system model. Its effectiveness is verified by closed-loop experimental control to the desired angle.

Honor

1. **Grand Prize** — Shanghai, China
   Siemens Cup China Intelligent Manufacturing Challenge Preliminary — *06.2017*
2. **Second Prize** — Shanghai, China
   Siemens Cup China Intelligent Manufacturing Challenge Final — *08.2017*
3. **Honorable Mention** — Shenyang, China
   Mathematical Contest In Modeling (MCM) — *02,2017*
4. **First Prize** — Shenyang, China
   The Chinese Mathematics Competitions (CMC) — *12,2016*
5. **Third Prize** — Shenyang, China
   Contemporary Undergraduate Mathematical Contest in Modeling — *11,2015*
6. **Gold Prize** — Shenyang, China
   China College Students' 'Internet+'Innovation and Entrepreneurship Competition — *09, 2016*

Personal Experiences

1. Student representative speech for undergraduate graduation ceremony — Shenyang, China — *07.2018*
2. Weekly volunteer for the orphanage — Harbin, China — *04.2015-2017.07*
3. Oral presentation for the 38th China Control Conference — Guangzhou, China — *07.27.2019-07.30.2019*
4. Oral presentation for the 39th China Control Conference online — Shenyang, China — *07.27.2020-07.29.2020*
5. Oral presentation for the 7th "Soft Robot Theory and Technology" seminar — Weihai, China — *10.29.2021-10.31.2021*