

# Tianyu Wang



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## EDUCATION

<b>Shanghai Jiao Tong University</b>	<b>Shanghai, China</b>
University of Michigan-Shanghai Jiao Tong University Joint Institute	
Bachelor of Science in Electrical and Computer Engineering ( <i>with ABET Accreditation</i> )	2014.09-2018.07
• GPA: 3.69/4.0      Rank: 9/97      TOEFL: 102      GRE: 326+3.5	

## PUBLICATIONS

- [1] T. Wang, L. Ge, and G. Gu\*, “Programmable design of soft pneu-net actuators with oblique chambers can generate coupled bending and twisting motions,” **Sensors and Actuators A: Physical**, 2018, 271C: 131-138. [Available online] <https://doi.org/10.1016/j.sna.2018.01.018>  [PDF](#)
- [2] J. Zou, T. Wang, and G. Gu\*, “Modeling the rate-dependent hysteresis of dielectric elastomer actuators with a modified Prandtl–Ishlinskii model,” **Smart Materials and Structures**, 2017. (*Under review*)
- [3] S. Wei, T. Wang, and G. Gu\*, “Design of a Soft Pneumatic Robotic Gripper Based on Fiber-reinforced Actuator,” **Journal of Mechanical Engineering**, 2017, 53(13): 29-38. <https://doi.org/10.3901/JME.2017.13.029>  [PDF](#)
- [4] G. Gu, L. Dong, T. Wang, and X. Zhu, Force Feedback Apparatus and Method in bottom-up DLP 3D Printers for Soft Materials. **Chinese Patent**. (*Submitted in November 2017*)

## RESEARCH EXPERIENCE

<b>School of Mechanical Engineering / Institute of Robotics</b>	<b>Shanghai, China</b>
(Advisor: Prof. Guoying Gu)	2016.10-Present

### *Soft pneumatic robotic gripper based on fiber-reinforced actuator*

- Mastered fabrication methods of different kinds of soft pneumatic actuators (SPA), including multimaterial 3D printing, shape deposition manufacturing and soft lithography
- Tested performances (bending angle, contact force, etc.) of pneumatic fiber-reinforced actuators with multiple characteristic parameters (length of actuator, thickness of chamber wall, etc.) under varying input pressure
- Designed and manufactured a soft pneumatic robotic gripper with control simplicity and strong adaptive ability

### *Programmable soft pneumatic actuator (SPA)*

- Proposed a programmable design of multi-chamber (“pneumatic network”) SPA that enables us designing the specific actuator according to the desired motion by tuning the oblique angle of chambers
- Explored the motion of pneumatic network SPA, from 2D pure bending to 3D coupled bending and twisting motion, improved dexterousness and flexibility
- Raised up a novel method to decouple the complicated motion, numerically reconstructing and analyzing the SPA
- Conducted finite element analysis on hyperelastic material structures with large deformation (Software: Abaqus)

### *Dielectric elastomer actuator (DEA)*

- Mastered the work principle and the fabrication process of DEA with dielectric elastomer membranes
- Tested and analyzed hysteretic response of planar DEA under input voltage with high frequency and amplitude
- Proposed a new method, modified Prandtl–Ishlinskii modeling, to predict the hysteresis in DEA systems

### *Rehabilitation glove/soft robotic hand based on soft actuator*

- Optimized the structural design of soft actuator to mimic movement of fingers, improved the dexterity of soft robotic hand, solved collaboration difficulty between rehabilitation glove and patient’s hand
- Assisted completing pressure controlling system, which realized individual control of robotic hand fingers, complex gesture of robotic hand, and close-loop feedback control of rehabilitation glove (Device: PLC)

**Hysteresis nonlinearity of piezoelectric actuator** | (Advisor: Prof. Kok-Meng Lee) 2015.03-2016.03

- Participated the research, studied controlling theories of smart materials in mechatronics systems
- Assisted on experiments, including experiment set-up building up, instruments operation, and data acquisition
- Programmed the algorithm for quick data processing, carried out data analysis

**Bottom-up DLP 3D printer for smart material actuators** | (Advisor: Prof. Xiangyang Zhu) 2017.06-2017.10

- Designed soft structures for printing and helped with detailed designs of the printer for higher printing quality
- Co-proposed a Chinese patent on force feedback devices and methods employed in the printer

**Institute of Automation / Autonomous Robot Lab**

**Shanghai, China**

**Rotational visual recognition system** | (Advisor: Prof. Jingchuan Wang) 2016.05-2016.09

- Constructed a multi-threaded data processing program for results collecting and proofreading (Language: Python)
- Established communication among single chip machine STM32, data processing software and identification program with RS-232 serial port and TCP/IP protocol, respectively
- Modified a visual recognition algorithm for robot arms, improved recognition accuracy by 5% (Library: OpenCV)
- Achieved *Silver Medal* in Advanced Vision Division of China Robot Competition (Class-A event in China)

## COURSEWORK

**Introduction to Engineering** 2014.09-2014.12

**Controllable hovercraft** | (Advisor: Prof. Shane Johnson & Prof. Andrew Yang)

- Developed a controllable hovercraft could scramble over obstacles and move along the designated route
- Won the championship of hovercraft competition, achieved Best Presentation Award in Design Expo 2014

**Introduction to Robotics** 2017.05-2017.08

**Localization of an autonomous mobile robot** | (Advisor: Prof. Yu Zheng)

- Established a model of mobile robot in simulation software V-REP and realized closed-loop motion control to it
- Studied common methods employed in mobile robot localization and implemented line-based extended Kalman Filter for robot localization in simulation scenario

## CONFERENCE ATTENDANCE

- The 10<sup>th</sup> International Conference on Intelligent Robotics and Applications 2017.08
- The 2017 International Symposium on Theory and Technology of Soft Robotics 2017.12

## AWARDS AND HONORS

- Silver Medal in Advanced Vision Division of China Robot Competition 2016.10
- Academic Excellence Scholarship (Top 10%, three times) 2015-2017
- Dean's List (For outstanding academic performance, six times) 2015-2017
- Civic Engagement & Community Service Award 2015.12
- Covidien Scholarship (Top 2%) 2015.03
- National First Prize in the Chinese Mathematical Olympiad 2014.01

## ACTIVITIES

- Teaching Assistant | *VE216 Signal and System* 2017.02-2017.05
- Book Bar of Joint Institute | *Founder and Supervisor* 2015.04-2016.06
- Student Union of Joint Institute | *Vice-minister of Career Department* 2015.03-2015.12
- Joint Institute basketball team | *Member & Tactical Assistant Coach* 2014.10-Present

## SPECIAL SKILLS

- **Software:** MATLAB, UG, Catia, Solidworks, AutoCAD, ABAQUS, Xilinx, Origin, Pspice, etc.
- **Programming Language:** C, C++, Python, Verilog HDL, MATLAB, etc.
- **Electronic Device:** Arduino, STM32, FPGA, PLC, etc.
- **Fabrication:** 3D Printing, Shape deposition manufacturing, Soft lithography, Laser cutting, etc.