**N**ext-generation **A**utomated **S**urgical **A**pparatus Lab

*National Taiwan University, Taipei, Taiwan, Since 2018*

Our vision: Become the bridge between human and technology

**News**

* **2019/10/9:** To prospective students: We have open positions for undergraduate, MS, and PhD students. Please feel free to visit the lab before contacting with the professor. We greatly welcome students who are self-motivated and having a keen interest in research on control and robotic technologies.
* **2019/10/9:** New website online!

**People**

* Lab PI: Prof. Cheng-Wei Chen
  + Assistant Professor
    - Electrical Engineering, National Taiwan University
    - ORCID: https://orcid.org/0000-0003-4807-3340
  + Research Interests
    - Robotics, Mechatronics, Digital control, Automation, Optimization.
  + Major research area
    - Surgical robots, Image-guided automation, Precise motion control, Model predictive control, Iterative learning feedforward control.
  + Brief Bio
    - Cheng-Wei Chen received the B.S. degree in electrical and control engineering from the National Chiao Tung University in 2009, the M.S. degree in electrical engineering from the National Taiwan University in 2011, and the Ph.D. degree in mechanical engineering from the University of California - Los Angeles in 2018. He immediately joined National Taiwan University as an assistant professor after completing his PhD defense.
  + Teaching
    - Control Systems (2018 Fall, 2019 Fall)
    - Linear Systems (2019 Spring)
    - Precise Motion Control (2020 Spring)
  + Contact
    - Office: Room 520, Ming-Da Hall, Electrical Engineering, National Taiwan University
    - Email: cwchenee [at] ntu.edu.tw
* Current students
  + Yi-Hang Chuang 莊逸航 (MS/Human-Robot Interaction)
  + Ziang-Yan Zeng 曾湘妍 (MS/Embedded and Automated System)
  + Chun-Fu Kuo 郭峻輔 (MS/Human-Robot Interaction)
  + Hsing-Chi Chen 陳星齊 (MS/Microsurgical Robots)
  + Geng-Hao Zhang 張耕豪 (MS/Advanced Control and Optimization)
  + Chung-Chun Wang 王悰寯 (MS/Human-Robot Interaction)
  + Cheng-Han Lin 林承翰 (MS/Advanced Control and Optimization)
  + Xian-Hao Wu 吳先浩 (MS/Embedded and Automated System)
  + Yi-Chan Li 李易禪 (MS/Microsurgical Robots)
* Previous students
  + Coming soon

**Research**

* Microsurgical Robots
  + **We are building robots for teleoperated and automated microsurgery:** Da Vinci Surgical System achieves remarkable success in assisting surgeons to perform delicate manipulations during minimal invasive surgery. However, it is not yet suitable for performing microsurgery in the fields such as ophthalmology, dentistry, and pediatrics. To address this need, we are devoted to designing microsurgical robots based on the knowledge in mechanism design, system integration, and precise motion control.
  + Recent results
    - A new prototype with a precise remote-center-of-motion and back-driven insertion/retraction
* Human-Robot Interaction
  + **We are searching the best way for robots to interact with human:** Teleoperation is a very different experience compared with conducting a task in person. This difference creates the gap hindering novel technologies to be applied in traditional workspace. In order to mitigate this problem, we focus on developing haptic and visual feedback that provides essential information to the human operator. Our ultimate goal is to create an immersive environment for human when interacting with the robotic system.
  + Recent results
    - Gaze-guided endoscopic system
    - Auto-tuned motion scaling
* Embedded and Automated System
  + **We are saving the cost of time and labor by leveraging automation technologies:** By applying automation technologies, a complicated task can be easily and rapidly completed. The applications are interdisciplinary covering from surgical systems to CNC machining. Our research also includes FPGA-based digital control, which creates more possibilities in improving the system performance.
  + Recent results
    - Automatic instrument changing system
* Advanced Control and Optimization
  + **We are designing advanced controllers for all the interesting applications:** Control theories are not just math. They are powerful tools in solving tough engineering problems, especially when both performance and robustness are essential to the application. We have cool projects which have the potential to work in a smart factory or even beyond the atmosphere!
  + Recent results
    - Model-Free convergence rate acceleration for iterative learning control

**Publications** (link to google scholar)

**Contact**

Location: Room 206, EE-IV Hall, Electrical Engineering, National Taiwan University

No.1, Sec. 4, Roosevelt Road, Taipei, 10617 Taiwan.