

1 Generally Education Background

2 Research & Work Experience

3 Skill & Research interests

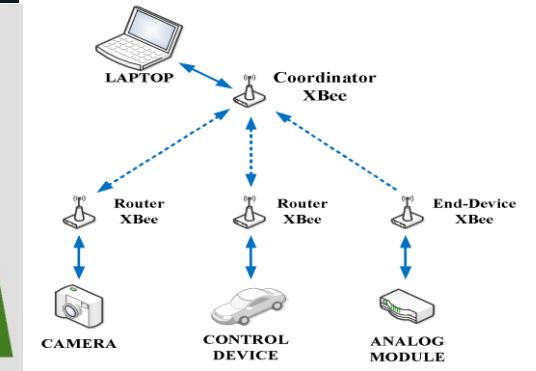
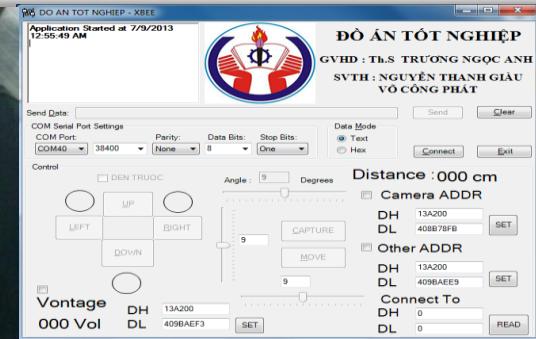
1. GENERALLY EDUCATION BACKGROUND

- ❖ Ph.D. in **Mechanical and Automotive Engineering**,
Department of Mechanical Engineering, University of Ulsan, South Korea, Feb. 2021.
- ❖ M.S. in **Mechatronics Engineering**,
Department of Mechanical Engineering, Ho Chi Minh City University of Technology and Education, HCMC, Vietnam, Jun. 2016.
- ❖ B.E. in **Electrical and Electronic Engineering Technology**,
Department of Electrical and Electronic Engineering Technology, Ho Chi Minh City University of Technology and Education, HCMC, Vietnam, Sep. 2013.

2. RESEARCH & WORK EXPERIENCE (09/2009 - 05/2013)



The B.E Degree in Electrical and Electronic Engineering Technology at HCMUTE, Viet Nam.
Graduation thesis: “Research and Development XBEE Network in System Monitor and Control”. (Graduation thesis grade: 9.6/10)



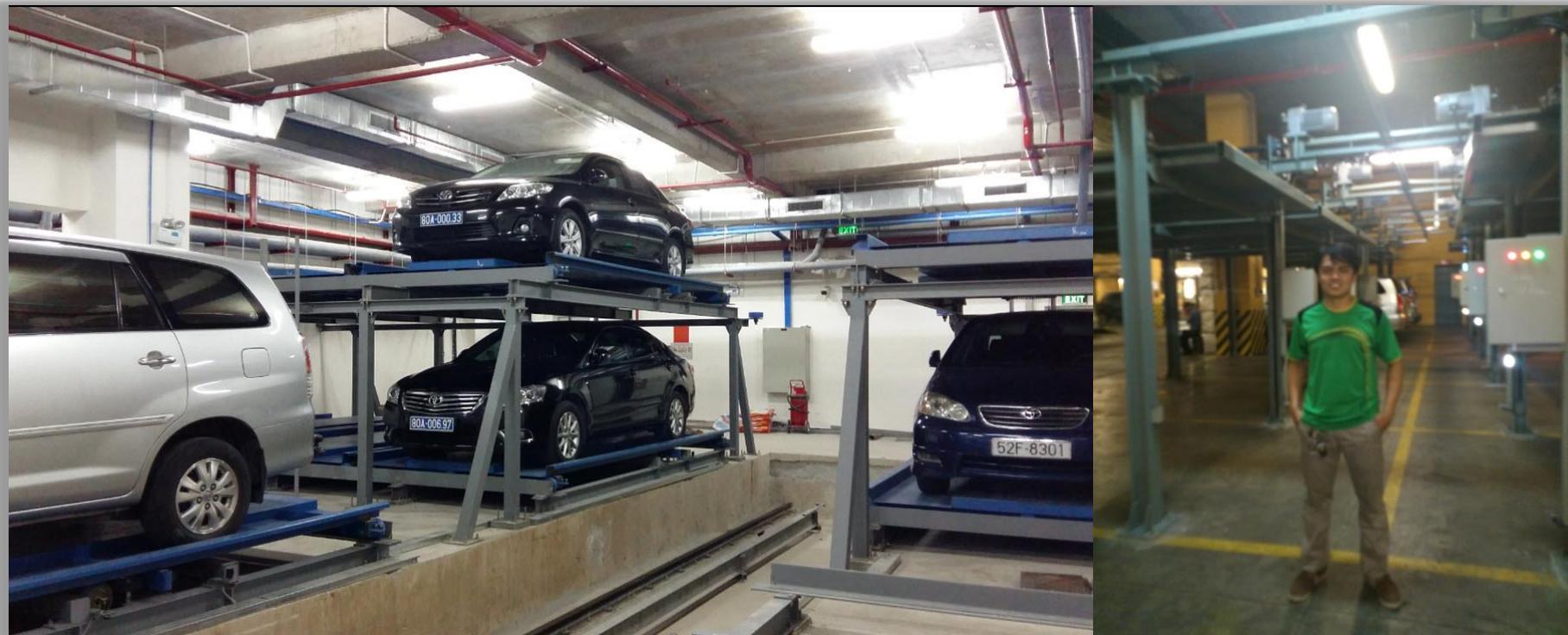
- 3rd prize in Science Research at HCMUTE entitled: “Development Bluetooth technology in Smart Car Control”.

2. RESEARCH & WORK EXPERIENCE (10/2012 – 02/2015)

❖ Technician for Daewoo Royal System Company.

Took primary responsibility for the program control of the projects:

- Automated Car Parking System



a. The Ho Chi Minh City Supreme People's Court

b. Bitexco Financial Tower

2. RESEARCH & WORK EXPERIENCE (10/2012 - 02/2015)

Main responsibility is programming control of projects:

- Battery production line of CSB Battery Technologies Co., GS Battery Vietnam Co., Ltd, and Hyosung Viet Nam Co., Ltd



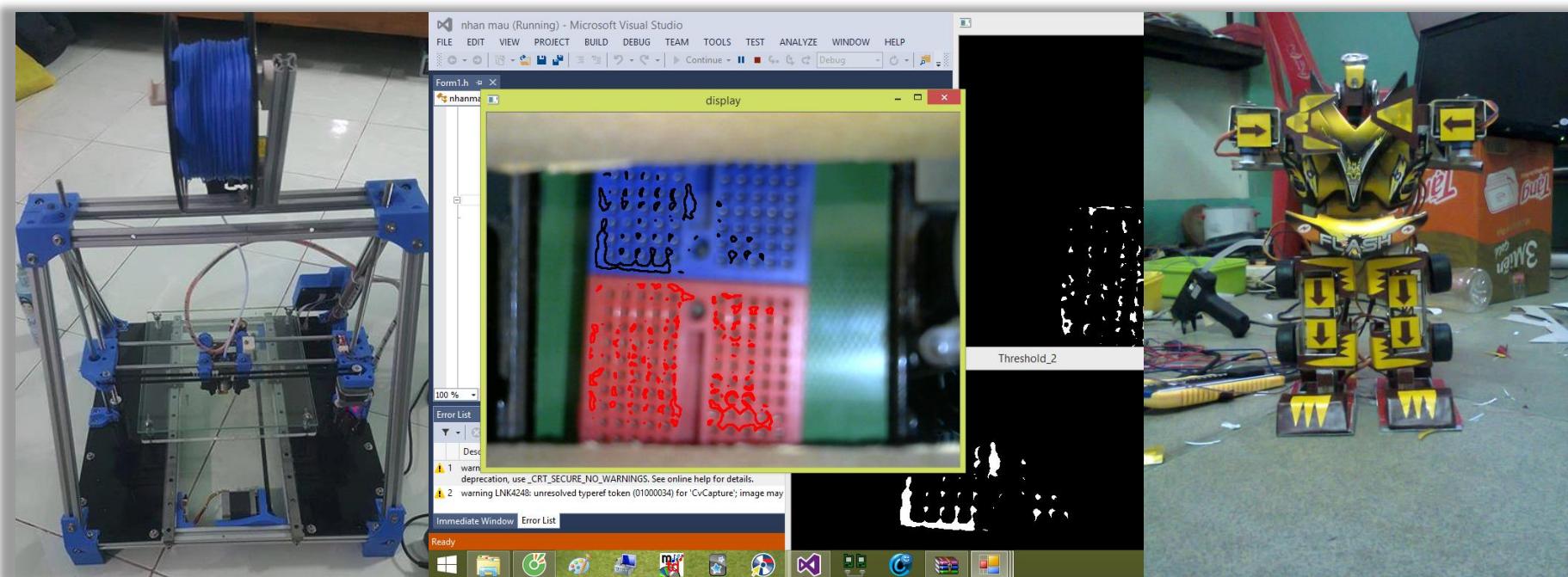
2. RESEARCH & WORK EXPERIENCE (09/2014 - 08/2017)

❖ 09/2014 – 08/2017

Assistant Lecturer at Faculty of Mechanical Engineering, HCMUTE.

Lecturer at Faculty of Electrical and Electronics Engineering, Thu Duc College of Technology.

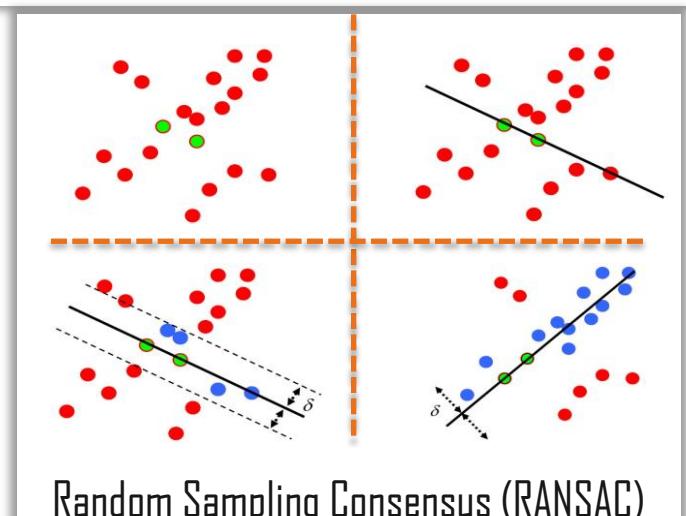
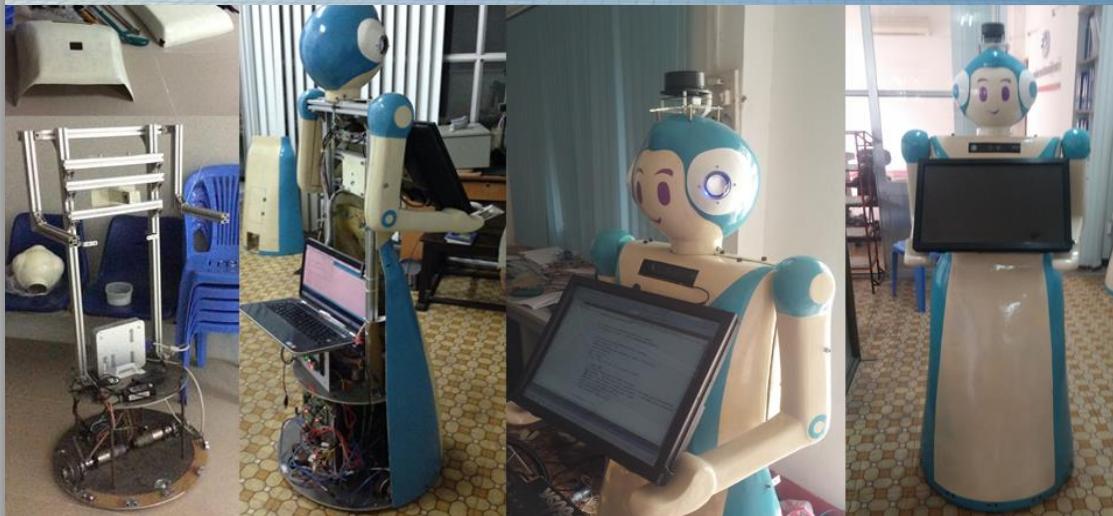
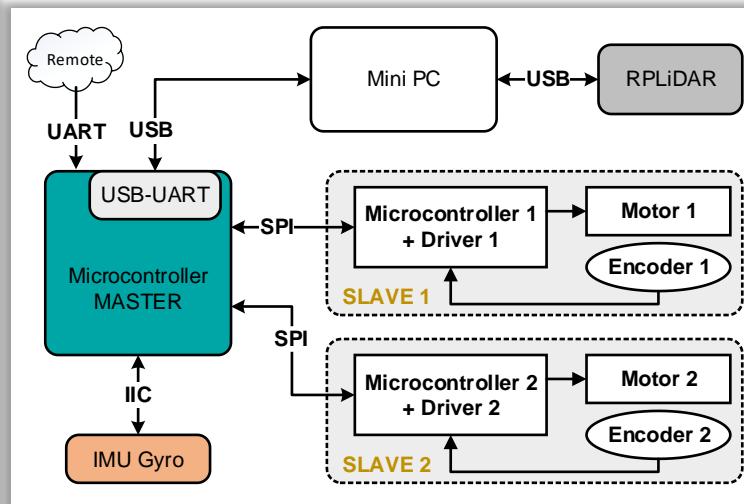
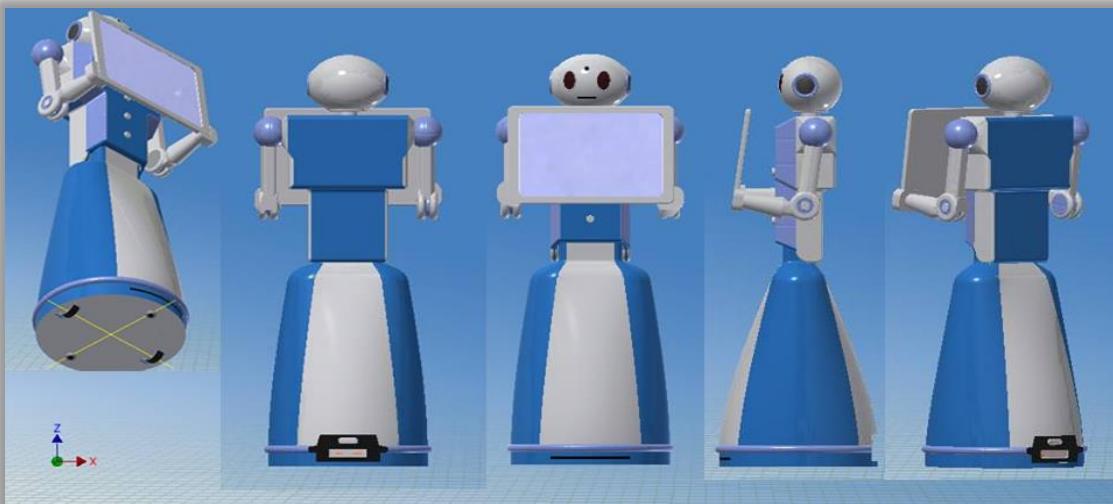
Modules: Microcontroller, C Programming Language, Measure and Control, PLC (Programmable Logic Controller), Circuit Design, AutoCAD 2D, ...



2. RESEARCH & WORK EXPERIENCE (09/2014 - 06/2016)

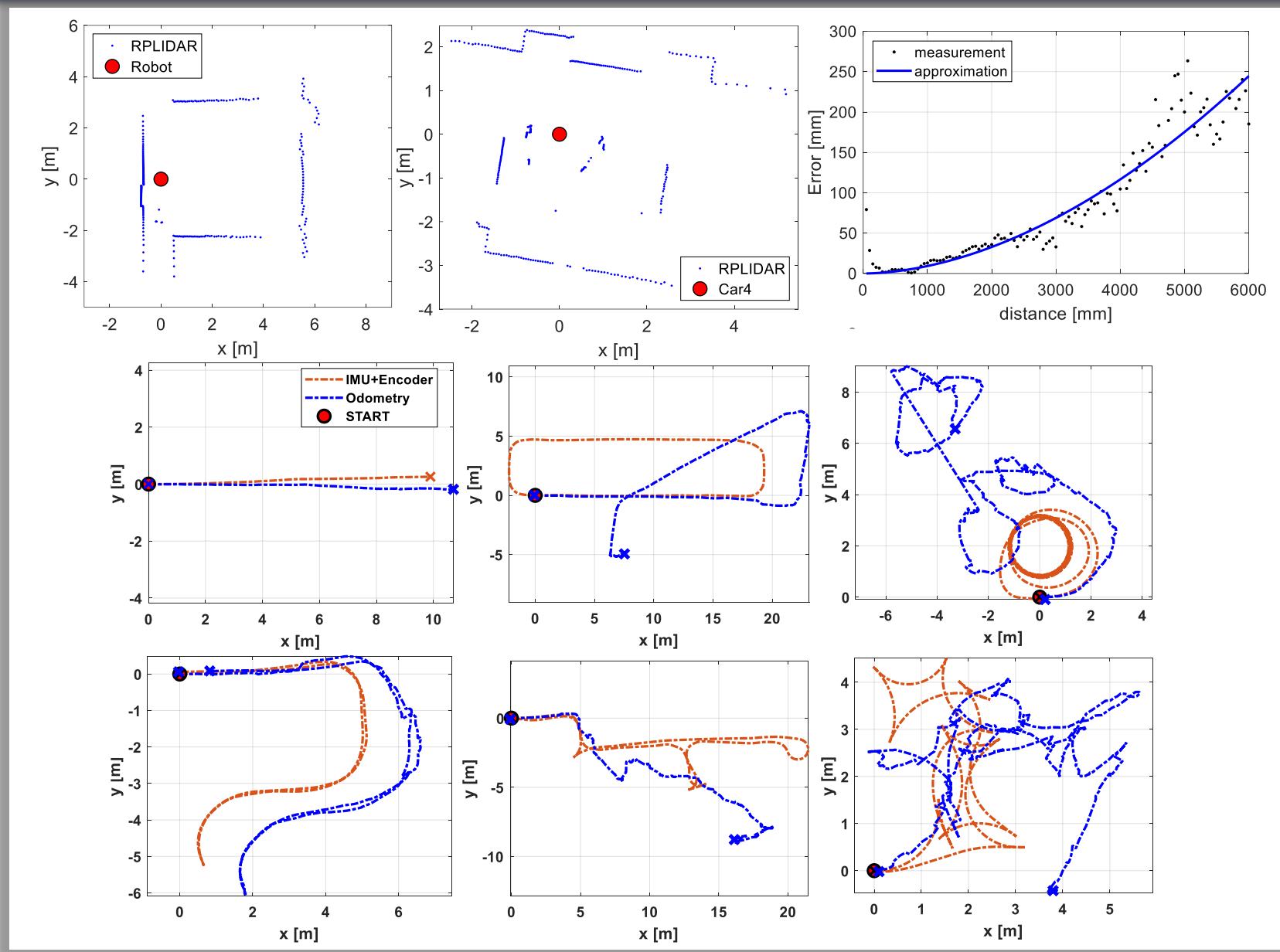


The Master Degree in **Mechatronics Engineering** at HCMUTE, Viet Nam. A thesis entitled:
“**2D Lidar-Based SLAM Algorithm and Path Mapping for Reception Robot**”. (Grade: 8.3/10)

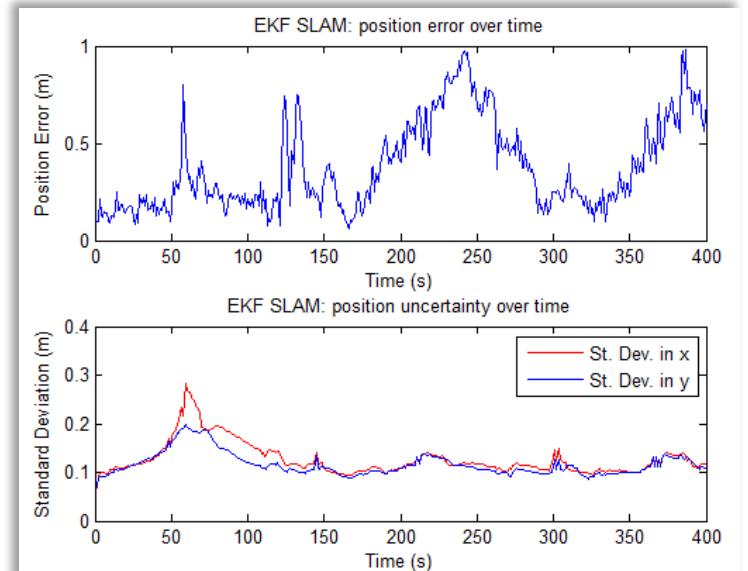
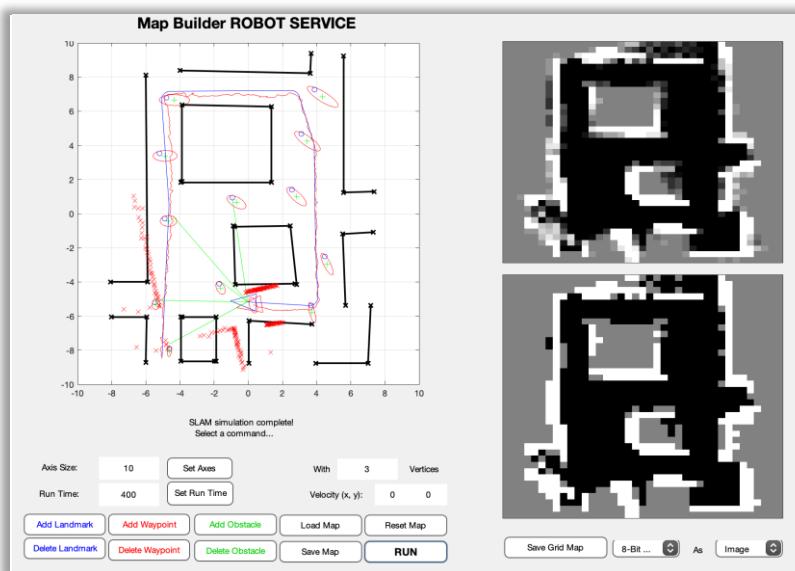
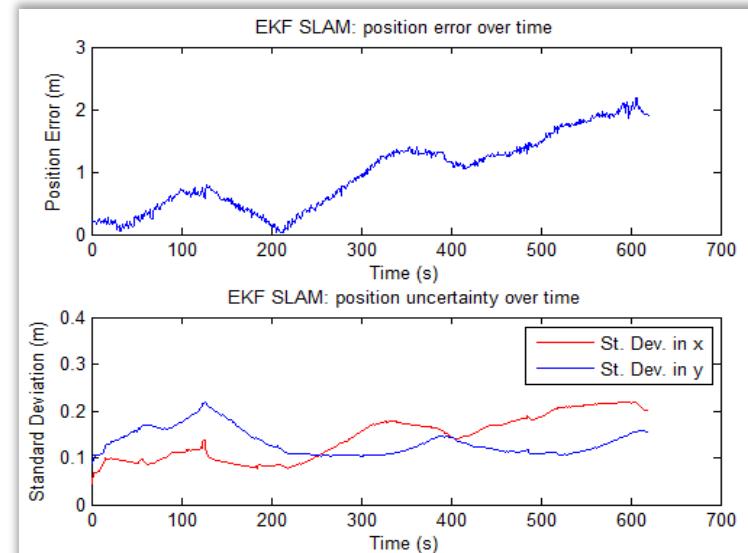
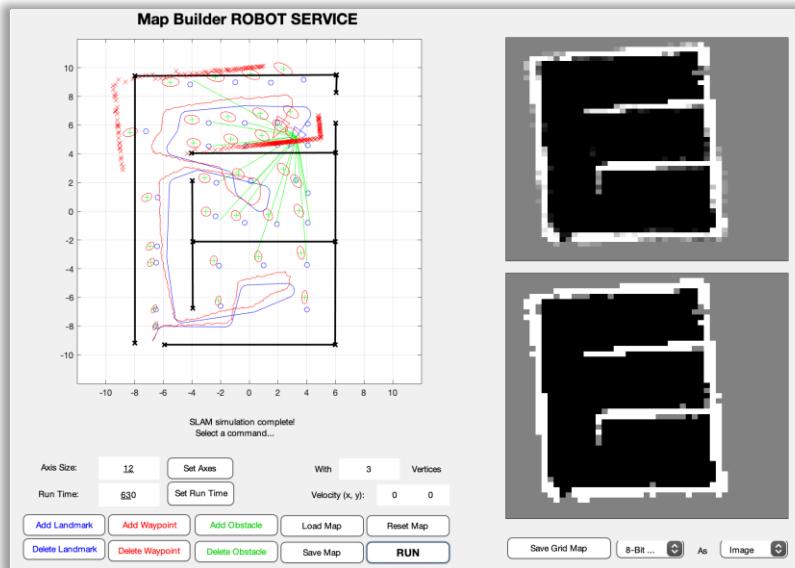


Random Sampling Consensus (RANSAC)

2. RESEARCH & WORK EXPERIENCE (09/2014 - 06/2016)

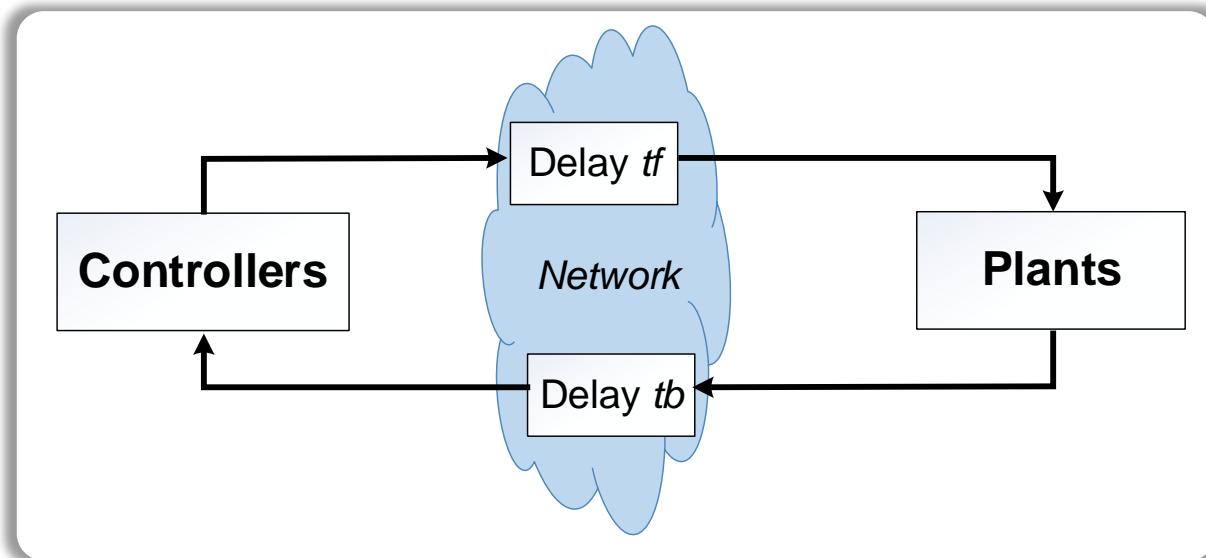


2. RESEARCH & WORK EXPERIENCE (09/2014 - 06/2016)



2. RESEARCH & WORK EXPERIENCE (09/2017 - 12/2018)

OVERVIEW OF NETWORK CONTROL SYSTEM (NSC)



evaluate

Fig. The structure of the Network Control System



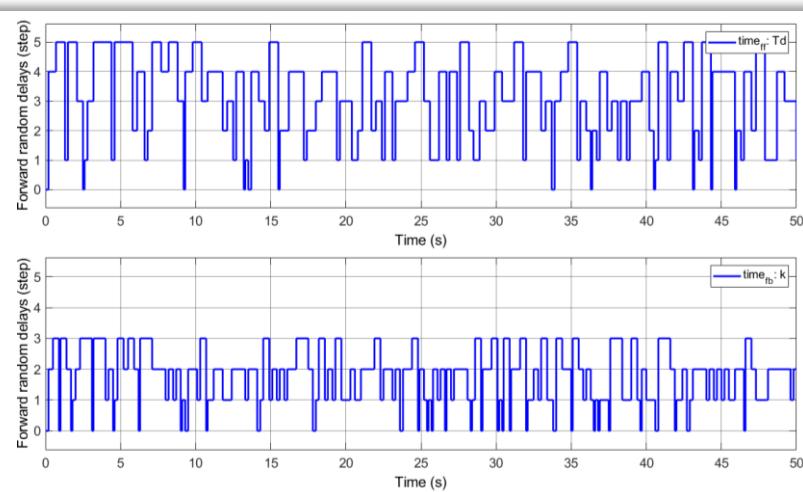
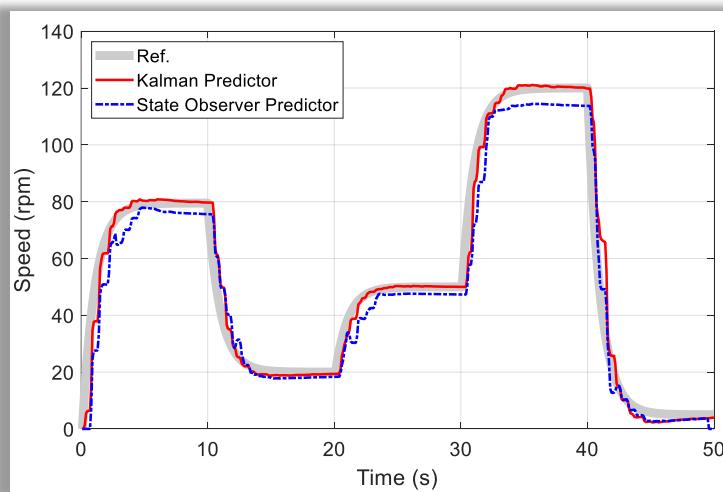
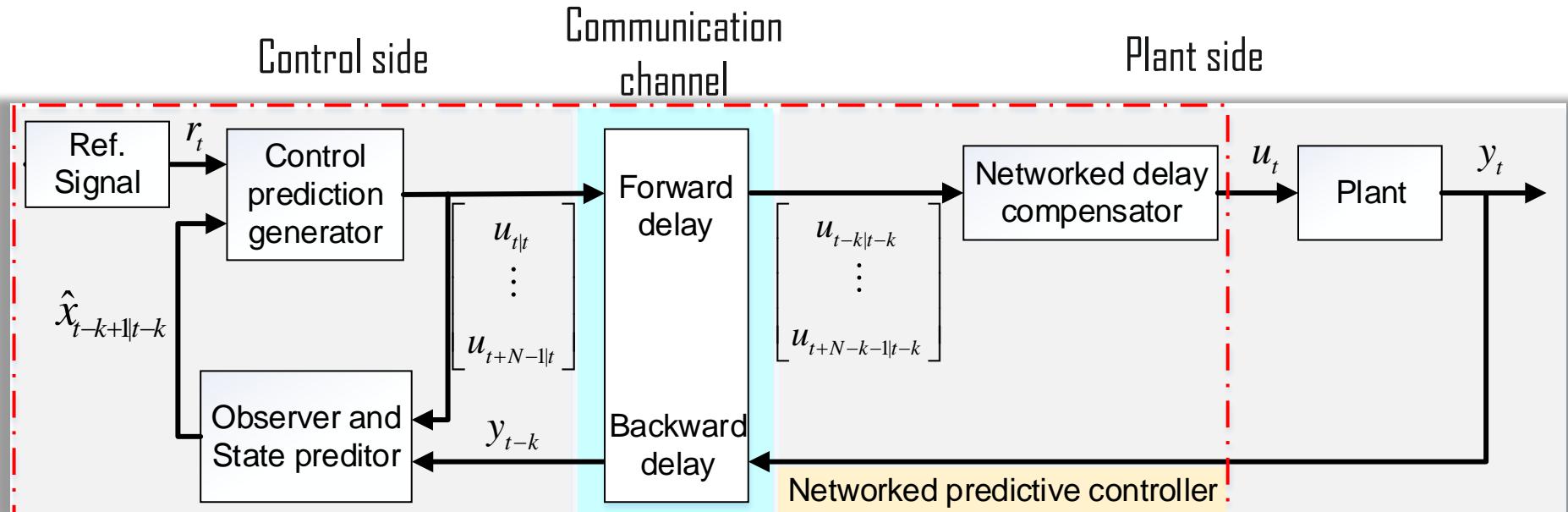
- Time delay
- Data packet dropout
- Data rate constraints

achieve

Networked predictive control algorithm,
Fault-tolerant control approaches

2. RESEARCH & WORK EXPERIENCE (09/2017 - 11/2018)

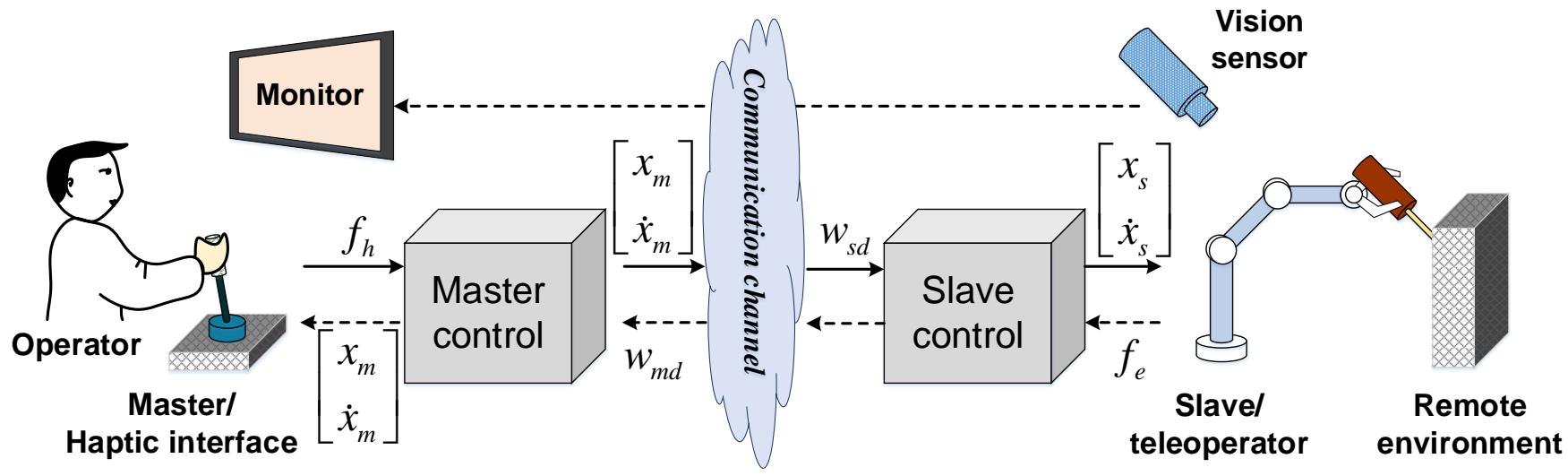
OVERVIEW OF NETWORK CONTROL SYSTEM (NSC)



2. EDUCATION BACKGROUND - Ph.D. (06/2018 -12/2020)



In 2021, Ph.D. in Mechanical and Automotive Engineering at University of Ulsan, Korea. A thesis entitled: "A Sensorless Reflecting Control for Bilateral Haptic Teleoperation System based on Pneumatic Artificial Muscle Actuators". (Grade: 4.3/4.5)



evaluate

Fig. The bilateral haptic teleoperation architecture.

Robustness
Performance
Perception
Transparency

achieve

Variable Impedance Control [5, 6]
Model-mediated Teleoperation [40]
Movement Estimation [78, 79]
Passivity [27], Prediction [39], ...

classify

Environment condition
Operator's characteristics
Communication channel

2. EDUCATION BACKGROUND - Ph.D. (06/2018 -12/2020)

Research Objectives of Ph.D. thesis

01 Propose Position Tracking Controller

An integral terminal-style SMC is designed with the combination of an adaptive gain and TDE technique

02 Propose Finite-Time Force Controller

An adaptive gain Fast ITSMC-TDE scheme is established with a friction-free disturbance technique in finite-time

03 Propose Model-free Control for slave-environment interaction

Applying RL approximation method to learning the optimal contact force (minimal) online

04 Propose optimal impedance for human-master interaction

Using IRL to optimize the prescribed impedance model parameters to assist minimum human effort

05 Propose Force Sensorless reflecting control for bilateral haptic teleoperation

The new AFQB is proposed to estimate the force signals. Achieving great transparency (position, force feedback)



2. EDUCATION BACKGROUND - Ph.D. (06/2018 -12/2020)

Platform setup

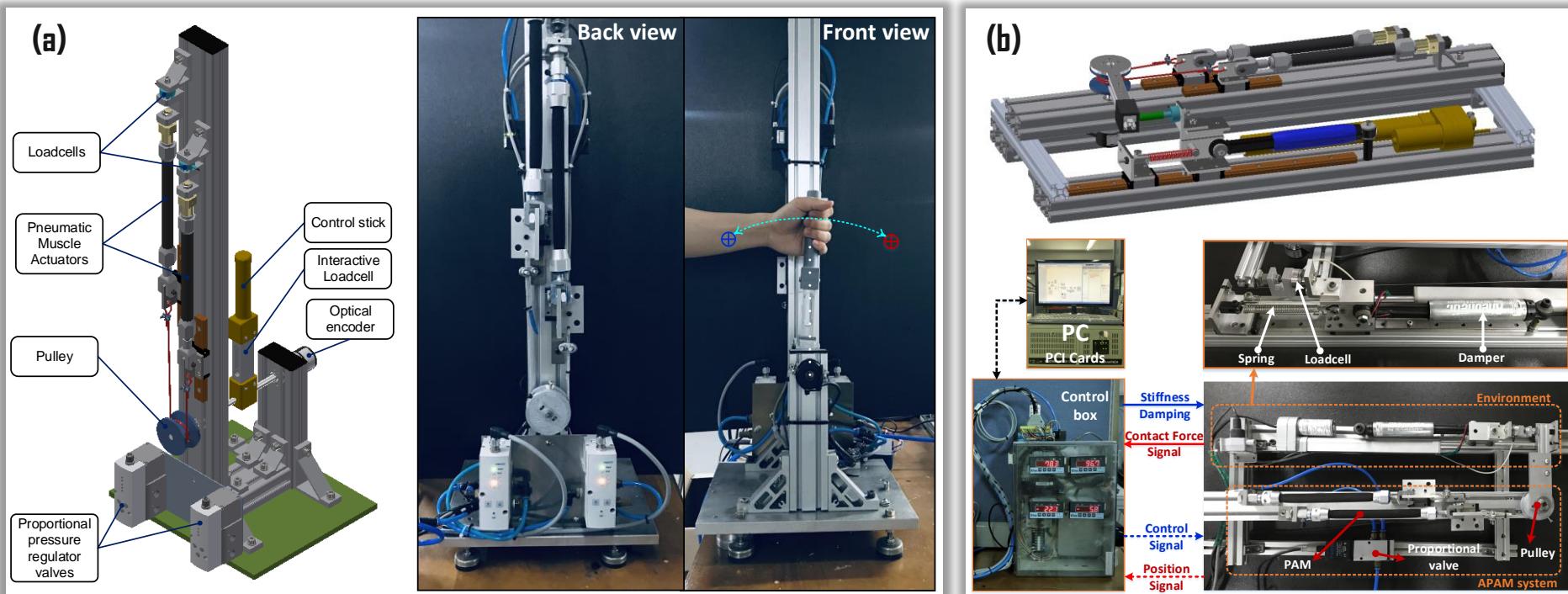


Fig. 2.5. The APAM-based (a) master and (b) slave subsystem configuration.

2. EDUCATION BACKGROUND - Ph.D. (06/2018 -12/2020)

Platform setup

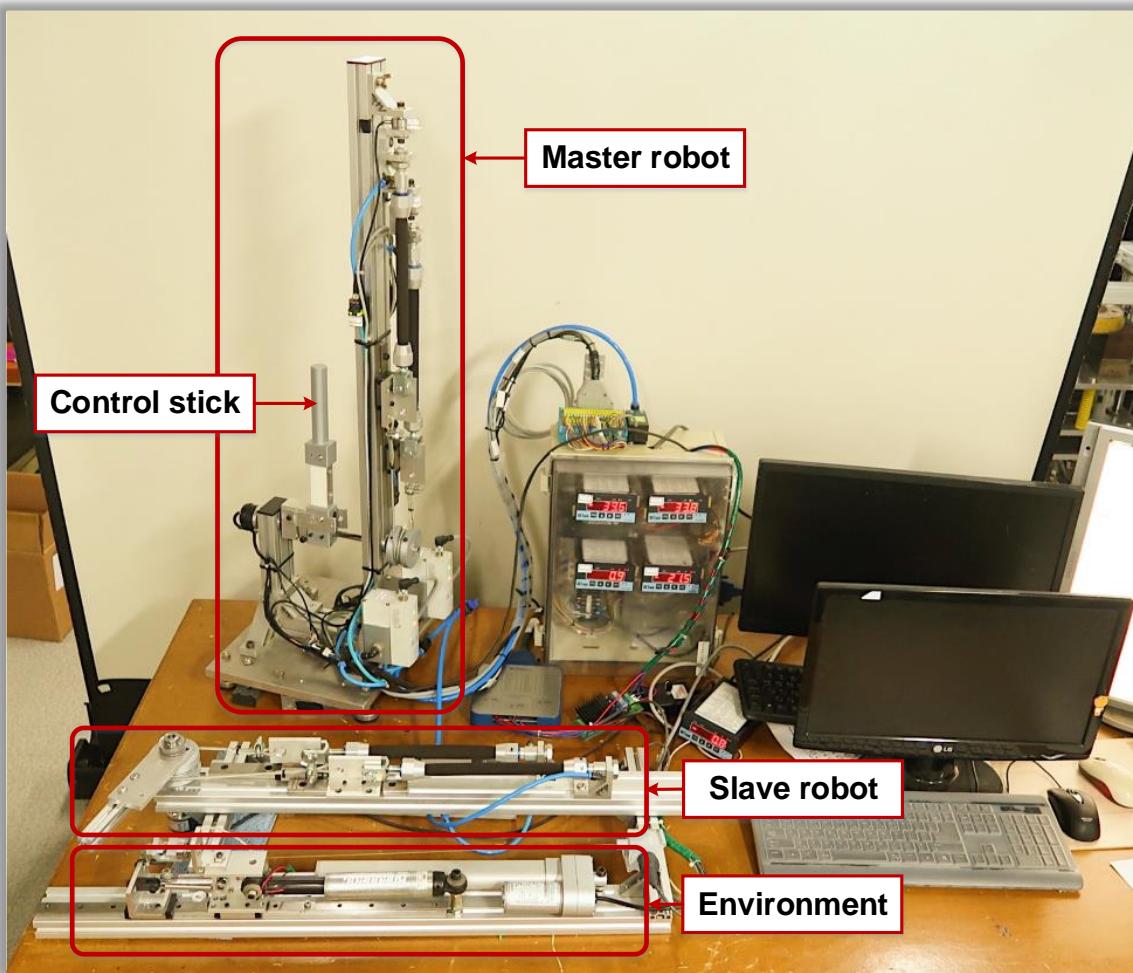
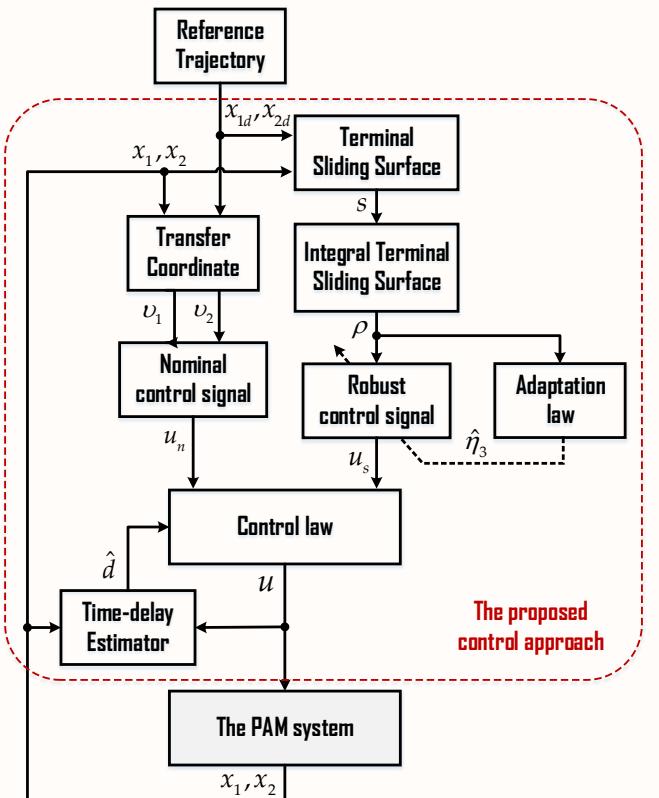


Fig. 2.6. Photograph of the experimental apparatus of the overview BHTS.



Chapter 3. AITSMC-TDE APPROACH FOR THE POSITION CONTROL



Robust performance against uncertainties and disturbances

Finite-time convergence of the tracking errors

Reducing the chattering phenomenon

Eliminating the reaching phase

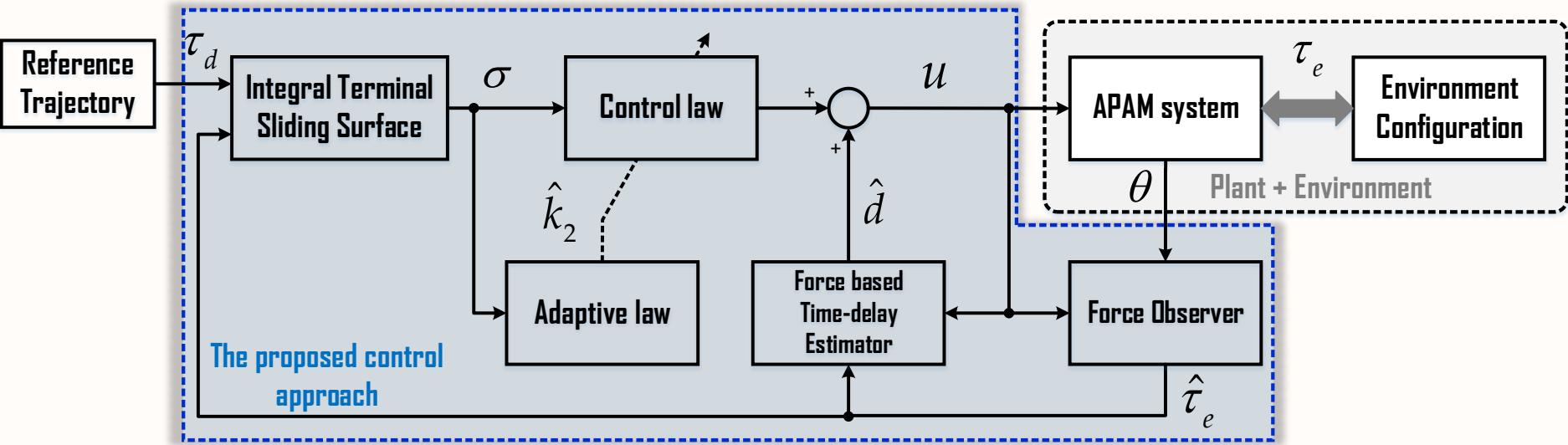
Fast transient response

C. P. Vo, X. D. To, and K. K. Ahn, "A Novel Adaptive Gain Integral Terminal Sliding Mode Control scheme of a Pneumatic Artificial Muscle system with Time-delay Estimation", IEEE Access, 2019.

Next works will be directed to the control using the **force properties**.



Chapter 4. ADAPTIVE FINITE-TIME FORCE SENSORLESS CONTROL SCHEME



- Improved the control performances (fast response, high accuracy, and robustness)
- Guaranteed the finite convergence
- Cancelling the lumped uncertainties via TDE solution and the switching gain in the FITSMC online

C. P. Vo and K. K. Ahn, "An Adaptive Finite-Time Force Sensorless Tracking Control of a Pneumatic Muscle Actuators with Time-Delay Estimation", IEEE Transactions on Control Systems Technology (Under Review)

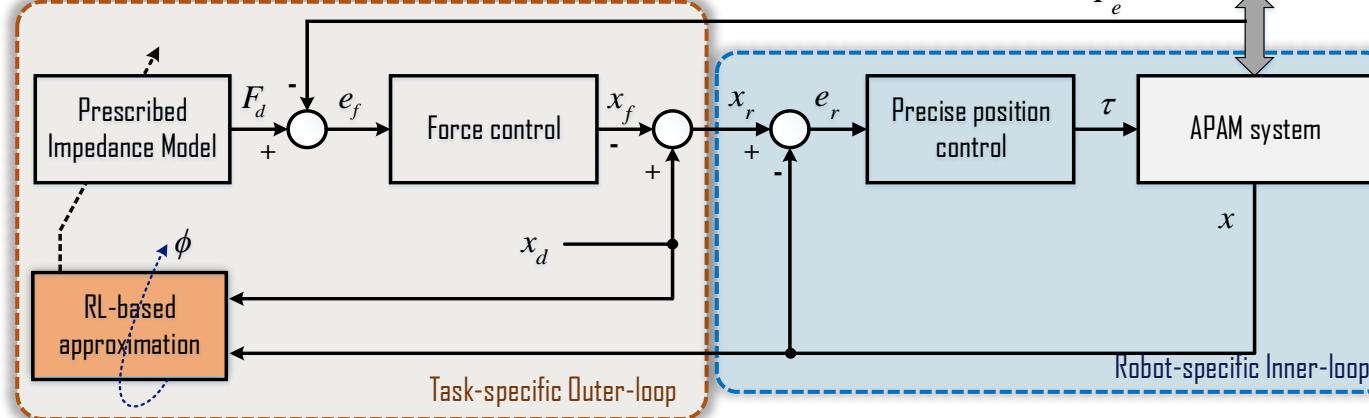


Next works will be directed to the control in **outer loop**.



Chapter 5. MODEL-FREE CONTROL FOR OPTIMAL CONTACT FORCE IN UNKNOWN ENVIRONMENT

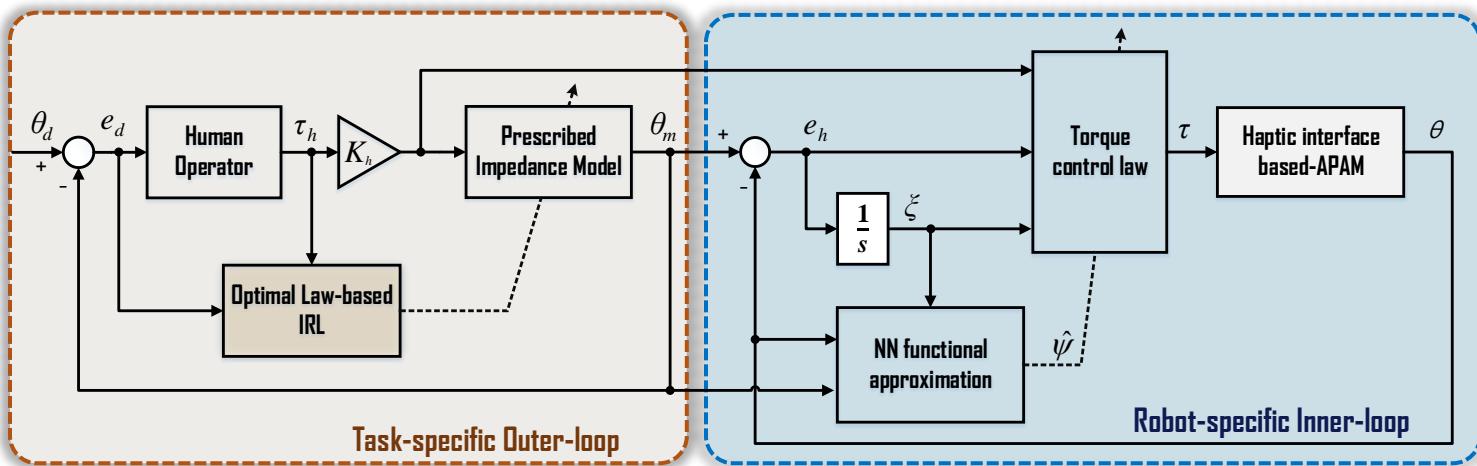
The environment is modeled as a spring-damper system



Chapter 6. OPTIMIZED HUMAN-ROBOT INTERACTION FORCE CONTROL USING IRL

A new augmented state

$$\begin{bmatrix} \dot{\bar{e}}_d \\ \dot{\tau}_h \end{bmatrix} = \begin{bmatrix} A_q & 0 \\ B_h & A_h \end{bmatrix} \begin{bmatrix} \bar{e}_d \\ \tau_h \end{bmatrix} + \begin{bmatrix} B_q \\ 0 \end{bmatrix} u_e$$



2. EDUCATION BACKGROUND - Ph.D. (06/2018 -12/2020)



Validation results (Chapter 5, 6)

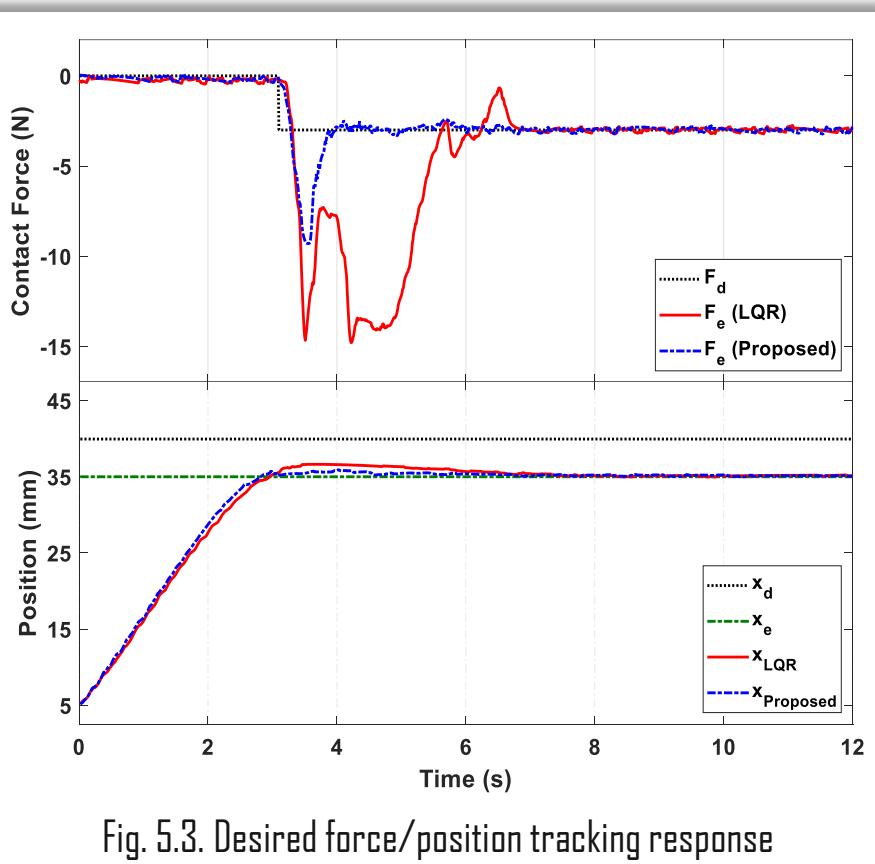


Fig. 5.3. Desired force/position tracking response

C. P. Vo and K. K. Ahn, "Reinforcement Learning-based Optimal Adaptive Impedance Control for Human-Robot Collaboration Tasks", IEEE Transactions on Industrial Electronics (Major Revision).

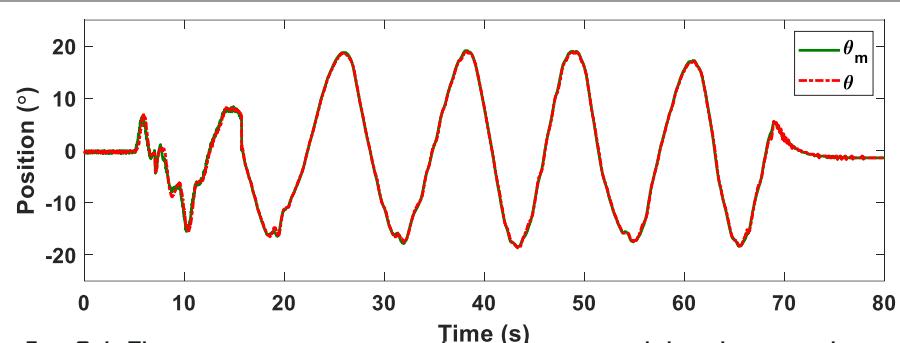


Fig. 6.4. The output trajectory and impedance model in the inner loop

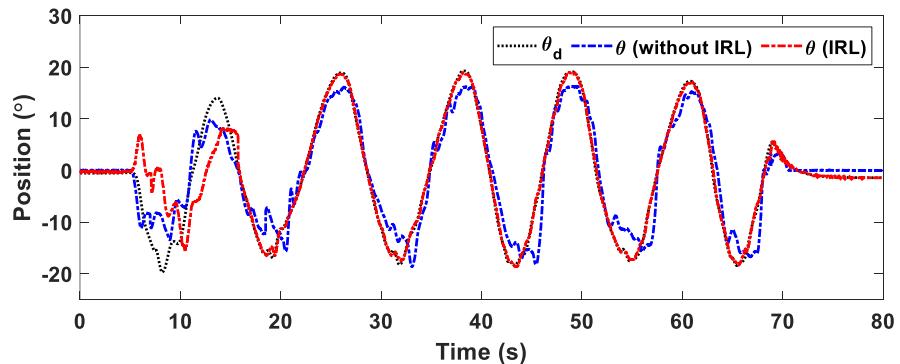


Fig. 6.5. The desired trajectory and output trajectory the outer loop

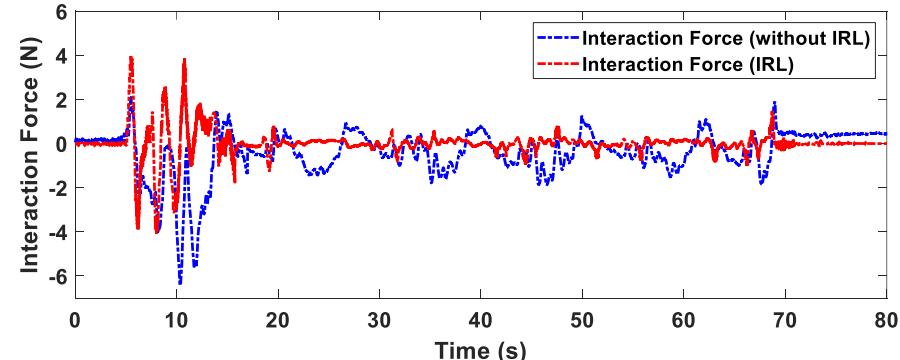
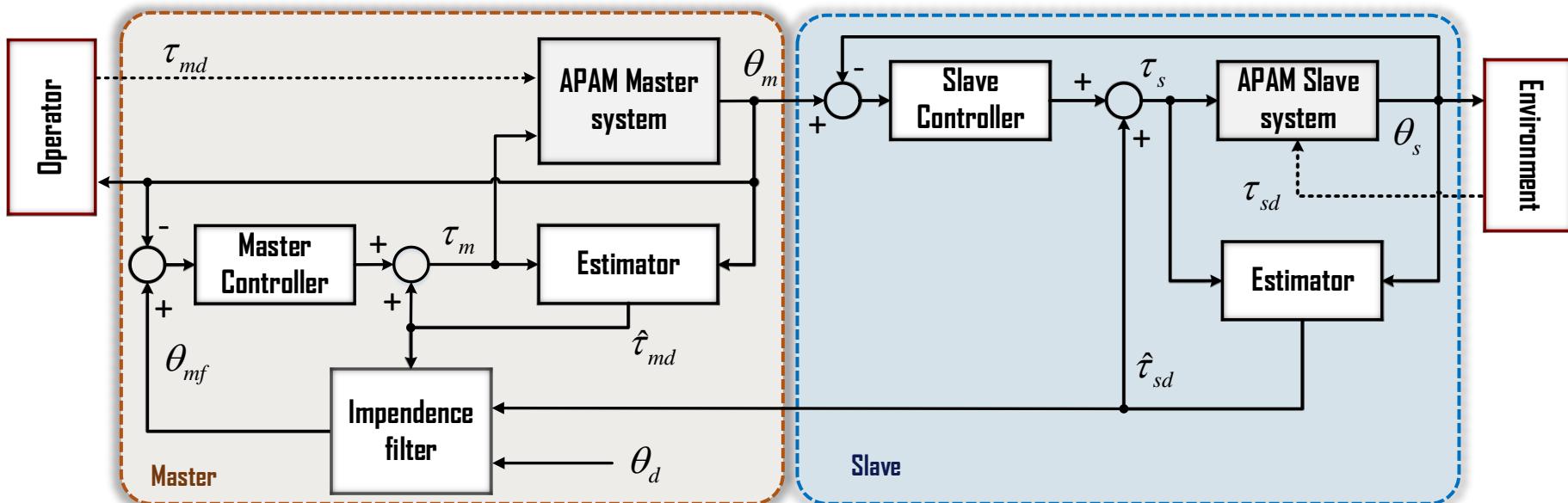


Fig. 6.6. Interaction force.

Control design (Chapter 7)



The external torque estimation

$$\dot{\tilde{\tau}}_{id} = -\delta\kappa(\Gamma_1 + \eta\Gamma_2)$$

where $\begin{cases} \Gamma_1 = -\Upsilon_1 \tilde{\tau}_{id} + \Omega \\ \Gamma_2 = -\sigma_i^{*T} \sigma_i^* \tilde{\tau}_{id} + \sigma_i^* \psi \end{cases}$

An adaptive FSQB gain

$$\dot{\kappa} = a\kappa - \kappa \sigma_i^{*T} \sigma_i \kappa$$

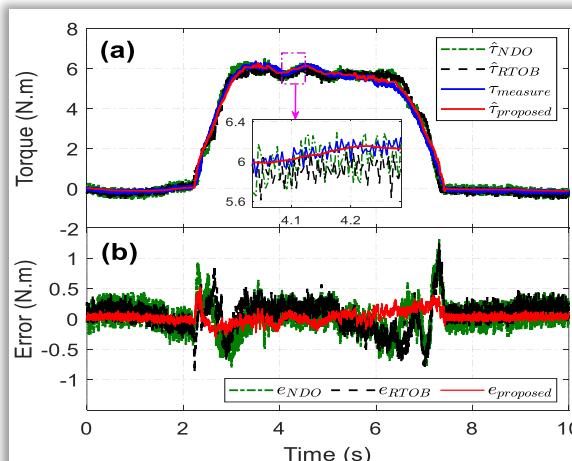


Fig. 7.1. Torque estimation performances.

C. P. Vo, X. D. To and K. K. Ahn, "A Novel Adaptive Gain Integral Terminal Sliding Mode Control scheme of a Pneumatic Artificial Muscle system with Time-delay Estimation", IEEE Access, 2019.

2. EDUCATION BACKGROUND - Ph.D. (06/2018 -12/2020)



Validation results (Chapter 7)

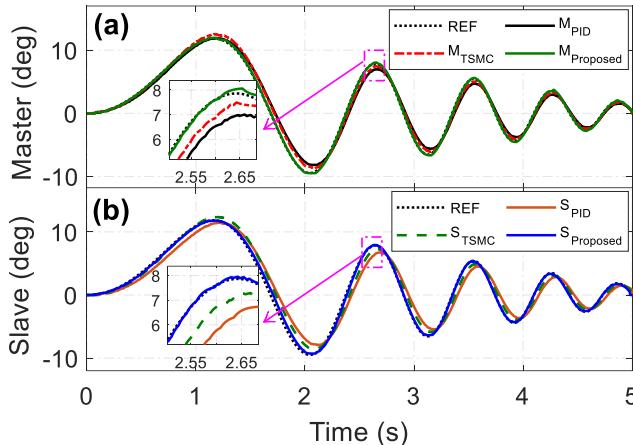


Fig. 7.2. Position tracking performances.

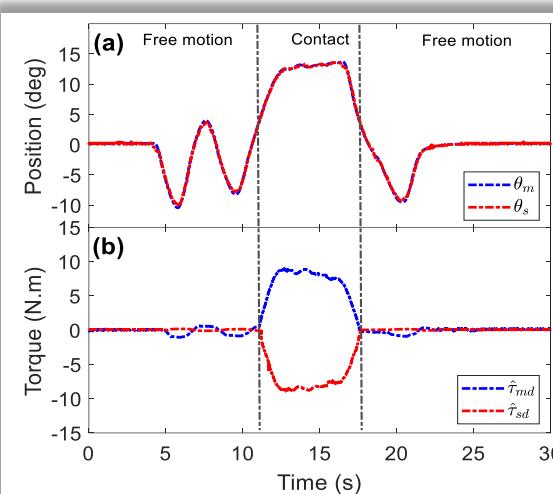


Fig. 7.2. Transparency performance in "soft"

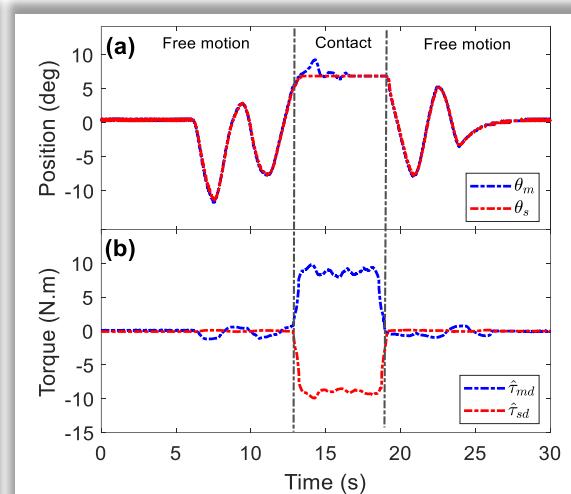


Fig. 7.2. Transparency performance in "stiff"

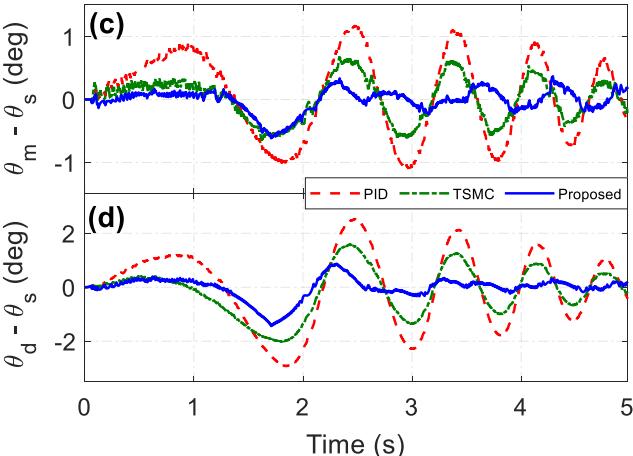


Fig. 7.2. Position tracking error performances.

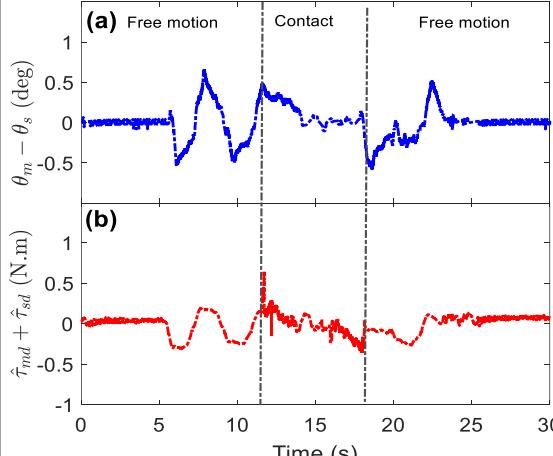


Fig. 7.2. Transparency error in soft contract

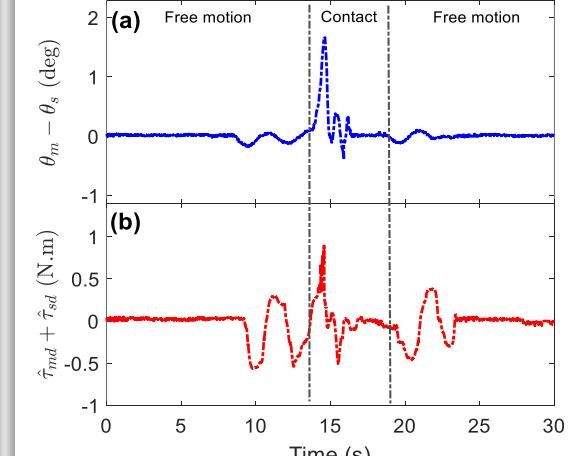


Fig. 7.2. Transparency error in stiff contract

8. SKILLS & RESEARCH INTERESTS



Conclusions



Digital-Twin-Assisted Fault Diagnosis; Proton-exchange Membrane Fuel-cells.
Fluid-based Triboelectric Nanogenerator; Floating Offshore Wind Turbines;



Control theory; Reinforcement learning in Optimal human-machine collaborative control;
Optimization; Haptic control in teleoperation, Fault-tolerant control.



Coding: MATLAB, Python, C/C++, PLC, HTML, Node.js, etc



Thank you for attending!