

BUCHUN SONG

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5, Hwarang-ro 14-gil, Seongbuk-gu, Seoul, Republic of Korea
(02792)

EDUCATION

Ph.D. in Mechanical Engineering

Feb. 2021

Yonsei University, Seoul, Republic of Korea,

Dissertation: “(A) study on a reference gait trajectory and nonlinear control design for a gait assistive exoskeleton robot”

Supervisor: Prof. Yoon Su Baek

MS. in Mechanical Engineering

Feb. 2017

Sungkyunkwan University, Suwon, Republic of Korea

Dissertation: “Drone obstacle avoidance algorithm using Fuzzy logic”

Supervisor: Prof. Kim, Hunmo

B.S. in Mechanical Engineering

Feb. 2014

University at Buffalo, Buffalo, NY, United states

RESEARCH INTERESTS

- Design and control of a sampling manipulator robot for remote specimen collection robot
- Developing wearable robot systems for augmenting or assisting human movements.
- Designing novel mechatronic systems utilizing various materials or mechanisms.

RESEARCH EXPERIENCE

KIST Korea Institute of Science and Technology

Post-Doc researcher

2021–present

Supervisor: Dr. Keri Kim

- Development of fast and contact-free screening system in pandemic risks

School of Mechanical Engineering, Yonsei University, Seoul, Republic of Korea

Graduate research assistant

2017-2021

Supervisor: Prof. Yoon Su Baek

- Designed and controlled a lower limb exoskeleton for assisting the knee joint of wearers walking on level ground.
 - Designed the controlled an electro hydraulic actuator (EHA) for assisting robot.
 - Managed and collaborated with a research team in which 9 researchers and 2 graduate students from 9 institutions and a company were participated.
 - Conducting internal meetings related to controller design.
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PUBLICATIONS

- **Song, B.**, Lee, D., Park, S. Y., and Baek, Y. S., “Design and Performance of Nonlinear Control for an Electro-Hydraulic Actuator Considering a Wearable Robot”, *process*, vol. 7, no. 6, June 2019, 389, doi: 10.3390/pr7060389. (IF: 2.847)
- Lee, D., **Song, B.**, Park, S. Y., and Baek, Y. S., “Development and control of an electro-hydraulic actuator system for an exoskeleton robot”, *Applied Sciences*, vol. 9, no. 20, Oct 2019, 4295, doi: 10.3390/app9204295. (IF: 2.679)
- Lee, T., Lee, D., **Song, B.**, and Baek, Y. S., “Design and control of a polycentric knee exoskeleton using an electro-hydraulic actuator”, *sensors*, vol. 20, no. 1, Dec 2019, 211, doi: 10.3390/s20010211. (IF: 3.576)
- **Song, B.**, Lee, D., Park, S. Y., and Baek, Y. S., “A Novel Method for Designing Motion Profiles Based on a Fuzzy Logic Algorithm Using the Hip Joint Angles of a Lower-Limb Exoskeleton Robot”, *Applied Sciences*, vol. 10, no. 19, Sep 2020, 6852, doi: 10.3390/app10196852. (IF: 2. 679)
- Park, S. Lee, D., **Song, B.**, Y., and Baek, Y. S., “Analysis and Modeling of Attractive Force Using an Electropermanent Magnet and Electromagnetic in a Novel Wobble Gripper”, *Actuators*, vol. 9, no. 4, Nov 2020, 116, doi: 10.3390/act9040116. (IF: 1.994)
- Park, S. Y., **Song, B.**, and Baek, Y. S., “A Theoretical Method for Designing Thin Wobble Motor Using an Electromagnetic Force and an Electropermanent Magnet for Application in Portable Electric Equipment”, *Applied Sciences*, vol. 11, no. 2, Jan 2021, 389, doi: 10.3390/app11020881. (IF: 2. 679)

CONFERENCES

Oral session

- **Song, B.**, and Kim, H. W., Choi, I., Jo, S., Cho, S., Hong, S.B., Jin, M., and Kim, H., “Application of an advanced graphic user Interface for the Coil tilter smart hybrid powerpack system”, *Proceedings of the ICEECET 2016 Conference*, April 24-26, 2016, Shanghai, China.
- Lee, J., Nam, J., **Song, B.**, Kim, H., Choi, I., and Kim, H., “Experiment of Sensor Fault Tolerance Algorithm combined with Cyber System for Coil Tilter on the Smart Hybrid Powerpack”, *Proceedings of the CYBER 2016 Conference*, Oct 9-13, 2016, Venice, Italy.
- Kim, H., **Song, B.**, Choi, I., Jo, S., Cho. S., and Kim, H., “Design of Graphic User Interface for Smart Hybrid Powerpack System with IoT Technology”, *Proceedings of the CPESE 2015 Conference*, Sep 9-11, 2019, Fukuoka, Japan.

Poster session

- **Song, B.**, and Baek, Y.S., “Design of Real Time Fuzzy Logic System for User intent Detection Using a Wearable robot”, *Proceedings of the ICESEE 2019 Conference*, December 12-14, 2019, Auckland, New Zealand, pp 17

PATENTS

Registered

- Kim, H., Jo, S., **Song, B.**, Kim, H,m Choi, I., and Hong, S, B., “MULTICOPTER CAPABLE OF ADJUSTING GAP BETWEEN PROPELLER”, KR Patent, No. 10-1818338, issued Jan 15, 2018.
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TECHNICAL SKILLS

- C language for programming
- Skills for building mechatronic systems using MCU boards (mainly uses DSP Texas Instruments with Code composer studio software)
- SOLIDWORKS (2-D and 3-D drawings, Structural analysis, Dynamics simulation)
- ANSYS (Multiphysics-structural analysis, Flexible multibody dynamics simulation)
- MATLAB (Solving mathematical equations, Optimization, GUI)

OTHER KNOWLEDGE

- Design of human- robot interaction (HRI) using weighted fuzzy logic algorithms
- Design of non-linear controllers (Adaptive sliding mode control, fuzzy control)

REFERENCES

Professor Yoon Su Baek

Motion Control Lab. (<http://mocolab.yonsei.ac.kr>)

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Yonsei University in Seoul, Republic of Korea

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Relationship: Thesis supervisor