Jaepil Ban

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Education

2012- **Pohang University of Science and Technology**, Pohang, South Korea
Candidate for integrated MS and PhD in Electrical Engineering
Advisor: Sangwoo Kim

2004-2012 **Ajou University**, Suwon, South Korea
Bachelor of Electronic and Electrical Engineering, February 2012

Research Interests

My research interests include: control and stability analysis of linear/nonlinear dynamical systems such as hybrid systems, reset control systems, networked control systems, and industrial systems; robust control; adaptive control; intelligent control; machine learning; optimization. I am currently interested in modern power systems including smart grids and microgrids with distributed energy sources.

Publications & talks

Journal articles

1. **Improved co-design of event-triggered dynamic output feedback controllers for linear systems**
Jaepil Ban, Minseok Seo, Taedong Goh, Hyeyun Jeong, Sang Woo Kim
Automatica (Under review)

2. **Robust H_∞ finite-time control for discrete-time polytopic uncertain switched linear systems**

Jaepil Ban, Wookyong Kwon, Sang Woo Kim
Nonlinear Analysis: Hybid Systems 20: 348-367, 2018

3. **Mold Oscillation Feedforward Control Algorithm for Sinusoidal Oscillation of Various Asymmetries**
Seung Hoon Kim, Minseok Seo, Jaepil Ban, Nam Woong Kong, Sang Woo Kim
ISIJ International 57.11: 2016-2021, 2017

4. **Multicriteria adaptive observers for singular systems with unknown time-varying parameters**
Wookyong Kwon, Jaepil Ban, Soo Hee Han, Changsoo Lee, Sangchul Won
Mathematical Problems in Engineering, 2017

Conferences

1. **Stability and $\mathcal{L}_2$-gain analysis of Impulsive Switched Systems with Average Dwell Time: Application to Hybrid Control** Jaepil Ban, Wookyong Kwon, Sang Woo Kim
American Control Conference, 2017.

2. **Localization of slab identification numbers using deep learning**
Sang Jun Lee, Jaepil Ban, Hyeyeon Choi, Sang Woo Kim
2016 16th International Conference on Control, Automation and Systems (ICCAS), IEEE, 2016.

3. **Decentralized H_∞ control of large-scale descriptor systems using proportional-plus-derivative state feedback**
Sungbin Kim, Wookyong Kwon, Jaepil Ban, Sangchul Won
2015 15th International Conference on Control, Automation and Systems (ICCAS), IEEE, 2015.

4. **Proportional multiple-integral observer based sliding mode control for linear systems with mismatched disturbance**
Hyung Woong Lee, Jaepil Ban, Sangchul Won
2015 15th International Conference on Control, Automation and Systems (ICCAS), IEEE, 2015.

5. **Fault estimation and fault-tolerant control of vapor compression cycle systems**
Jaepil Ban, Wookyong Kwon, Sangchul Won
2015 41st Annual Conference of the Industrial Electronics Society, IECON, IEEE, 2015.

6. **Generalized complex projective synchronization of chaotic complex systems with unknown parameters**
Jaepil Ban, Jinwoo Lee, Sangchul Won
2014 14th International Conference on Control, Automation and Systems (ICCAS), IEEE, 2014.

7. **Synchronization of two different chaotic systems using terminal sliding mode with disturbance observer**
Jaepil Ban, Jinwoo Lee, Sangchul Won
In *Proceedings of SICE Annual Conference 2013*, pp. 2575-2580.

Research Experience

Design of Alpha Grid platform and research on components technology
2018/03-
Collaborated with Korea Electric Power Cooperation *Supervisor: Prof. Sang Woo Kim*
· Developing a distributed optimal energy scheduling algorithm with distributed faulty energy resources.

Development of the artificial-intelligence-based control algorithm for automation of POSCO EMLPVD process
2017/08-2018/02
Collaborated with PIBEX (R&D Company of POSCO) *Supervisor: Prof. Sang Woo Kim*
· Developed a physical vapor decomposition process model by using an artificial neural network.
· Proposed an online-model-learning algorithm to enhance the accuracy of the neural network model in the lacking-data environment.

Development of simulator for Senzimir mill and improvement on control algorithm
2017/06-2018/03
Collaborated with POSCO *Supervisor: Prof. Sang Woo Kim*
· Derived a mathematical model of the Sendzimir mill (Z-mill) by using its geometry and force transformation.
· Identified the unknown parameters in the highly nonlinear model of the Z-mill by analyzing real operation data.
· Identified the linear mill model from data by using least square method.
· Developed an automatic flatness control that improves quality of the still product by using the derived mathematical model.

Welding point detection algorithm of lighting for vision system for automatic welding in shipbuilding process
2016/05-2016/08
Collaborated with Samsung Heavy Industries *Supervisor: Prof. Sang Woo Kim*
· Developed an end point detection algorithm from the noisy image of lighting vision system.
· Proposed a morphological operation based ellipsoid fitting for detecting the welding point and the proposed algorithm is robust and accurate in detecting the points compared to the points-based least square algorithm.

Real-time control of finishing mill for lateral movement of a strip by using programmable logic controller
2014/12-2015/09
Collaborated with POSCO *Supervisor: Prof. Sangchul Won*
· Designed a hardware in the loop simulator for 7-stand finishing mill with PLC.
· Proposed active disturbance rejection control for lateral movement of finishing mill to cope with model uncertainty and disturbances and applied it to the real plant.

· Designed a graphic user interface for the developed hardware in the loop simulator.
· Proposed a sensor fault detection algorithm by using proportional-integral observer and successfully detected the sensor fault of the finishing mill simultaneously.

Design of an embedded controller and control algorithm for heat pump systems
2013/10-2014/10
Collaborated with BnF Solution *Supervisor: Prof. Sangchul Won*
· Designed an embedded control system with microcontroller unit (MCU) for a two stage heat pump to control superheat temperature of refrigerant and water temperature.
· Designed a windows API-based monitoring program of a heat pump by using RS232 modbus protocol between PC and MCU.
· Proposed an optimal energy consumption algorithm for on/off controlled heat pump and reduced electric power consumption achieving satisfied level of water temperature.

Estimation of 3-dimensional temperature distribution for indoor air-flow control
2013/01-2013/12
Collaborated with LG Electronics *Supervisor: Prof. Sangchul Won*
· Designed a temperature measurement and monitoring system with a thermopile array sensor by using LabVIEW.
· Proposed an estimation algorithm of temperature distribution in a room by using adaptive-network-based fuzzy inference system (ANFIS).
· Proposed an online human detection algorithm by using temperatures obtained from the thermopile array sensor.

Active torque control for 1-Piston rotary compressor
2012/02-2013/07
Collaborated with LG Electronics *Supervisor: Prof. Sangchul Won*
· Designed a disturbance observer-based algorithm for reducing the vibration of 1-piston rotary compressor of air-conditioners.
· Proposed an adaptive disturbance compensation method to compensate unknown time-delay on phase measurement induced by the sensorless algorithm of the motor.

Development of sensing and control algorithm of a quadrotor UAV
2011/03-2011/12
Undergraduate Design Project *Supervisor: Prof. Suk-Kyo Hong*
· Designed low cost IMU sensor system by using a 3-axis gyro in Wii MotionPlus and 3-axis accelerometer.
· Proposed parallel core processors to perform controlling rotors and processing sensor signal simultaneously.

Grants, honors & awards

2009-2 Self-development Scholarship, Ajou University
2010-2011 Honor Scholarships for four semesters, Ajou University

Computer languages

MATLAB, Simulink, Appdesigner, Python, Tensorflow, OpenAI Gym, C, Windows API, PLC programming, LabView, OrCAD, PSpice, LaTeX