

*Senior R&D Researcher in Siemens PLM, emphasis in
Control Systems, ADAS and Autonomous Vehicle*

Overview

Research engineer working in autonomous vehicle industry sector. Strong background in control system area with a proven track record from theory, designing, to implementation. Active in research and development activities such as collaborations, publishing, reviewing, supervising PhD/Master students. Experienced project management and communication skills in multicultural and dynamic environments.

Education

- Oct. 2016 **Ph.D. in Mechanical Engineering**, KULeuven, Leuven, Belgium.
Advisors: Prof. Jan Swevers, Prof. Goele Pipeleers
- Feb. 2012 **M.S. of Research in Mechatronics**, GIST, Gwangju, South Korea.
Advisor: Prof. Hyo-Sung Ahn
- Jun. 2009 **B.S. in Electrical Engineering**, HUST, Hanoi, Vietnam.

(Recent) Updates

- Jan. 2019 **2018 Siemens DF PL Invention of the Year Award**.
- Sept. 2018 **Invited Talk in AutoSens Conference**, Brussels, Belgium.
AutoSens is an autonomous vehicle event, participants are the world's leading minds in ADAS and autonomous vehicles: <https://auto-sens.com/speakers-brussels/>
- May 2018 **Invited Seminar in Automatic Control Laboratory, EPFL**, Lausanne, Switzerland.
<https://memento.epfl.ch/event/simulation-based-testing-and-validation-framework-/>
- June 2018 **Invited Talk in REM2018**, Delft, Netherlands.
The 19th International Conference on Research and Education in Mechatronics: <http://www.rem2018.nl/>
- May 2018 **Presented in JSAE Annual Congress**, Yokohama, Japan.
Presented the Siemens PLM developments on autonomous valet parking planning and control
<http://www.jsae.or.jp/2018haru/english/>
- April 2018 **Presented in Transport Research Arena**, Vienna, Austria.
Presented the Siemens PLM co-simulation testing and validation framework for ADAS developments
<https://www.traconference.eu/>

Experience

- 2016–Present **Senior Research Engineer**, Siemens PLM, Belgium.
Working on EU and Belgian research and development projects, with focus on control and ADAS and autonomous vehicle domains

- Applications: autonomous valet parking, highway pilot, green wave technology, intersection crossing
- Optimal and model predictive control (MPC) developments with real-time implementations
- Collision avoidance (pedestrians, other vehicles) algorithm developments
- Virtual testing and validation of ADAS co-simulation system development framework
- Optimize control performance of autonomous vehicles through data-driven learning
- HEV vehicle model control to optimize fuel consumption
- Publishing journal, conference, patents and white papers

- 2016–Present **Project Management and Supervisor**, Siemens PLM, Belgium.
- Manage control and ADAS/AV projects: project administration and proposal writing, collaborating with partners
 - Supervise PhD, Master, and intern students in the R&D team
- 2012–2015 **EU Marie Curie ITN Training Programme**, EU FP7 IMESCON Project.
- EU Marie Curie scholarship to do PhD and research/training programs in EU
 - Model identification and feedback control design for the amplified piezo actuator, Cedrat Technologies (France).
 - Visited Cedrat Technologies company for doing model identification.
 - Attended various trainings, meetings within the EU FP7 project.
- 2012–2016 **Advance Control Design for Mechatronic Systems**, KU Leuven, Belgium.
- Control theory: linear and nonlinear control, robust control, optimal control...
 - Design techniques: PID, loop-shaping, model-based control, H-infinity control, MIMO control, feedforward control, model predictive control (MPC)...
 - Optimization tools: convex optimization, LMI, optimization softwares
 - Experimentally validated on a lab-scale overhead crane and XY wafer stage setups.
- 2012–2016 **Iterative Learning Control (ILC)**, KU Leuven, Belgium.
- Main PhD research topic
 - Proposed a novel robust norm-optimal iterative learning control in time domain
 - An optimization problem accounting for system uncertainty
 - Guarantee global optimal solution, and can be solved efficiently
 - Proposed and designed a multi-objective ILC problem in frequency domain
 - Robustness, convergence speed, tracking error, and input energy objectives
 - Efficient and straightforward computation of trade-off curves between objective indices. Help control engineers to choose their desired controller w.r.t. these compromises
 - Developed multivariable ILC analysis and design
- 2010–2012 **Research Assistant**, GIST, South Korea.
- Did research in the Distributed Control and Autonomous Systems Lab. (GIST)
 - Developed multiple points tracking iterative learning control

Skills

- ADAS Trajectory planning, tracking control, machine learning, vehicle dynamic simulation, environment simulation, test generation and automation, verification and validation of control algorithms
- Control System identification, analysis, control implementation, and validation
- Programming MATLAB, Simulink, Python, ROS, dSPACE, LabVIEW
PreScan, Vires VTD, Imagine Amesim.Lab, Imagine Embedded Software Designer, L^AT_EX, HTML

Professional Services

- Reviews Transport Research Arena (2018)
IEEE Transaction on Automatic Control (2014, 2015)
IEEE Transaction on Control System Technology (2017)
International Journal of Robust and Nonlinear Control (2018)
Control & System Letters (2015)
Mechatronics (2015, 2016, 2017)
International Journal of Control (2017)
IET Control Theory & Applications (2015, 2016)
IEEE Conference on Decision and Control (2013)
American Control Conference (2019)
IFAC Adaptation and Learning in Control and Signal Processing (2013)
- Memberships IEEE Control System Society, IEEE Robotics & Automation

Awards

- 2018 Siemens DF PL Invention of the Year
- 2012-2015 Marie-Curie Early Stage Researcher Fellowship
- 2011 Best presentation in session award, 2011 American Control Conference
- 2010-2012 GIST Scholarship for Master student
- 2009 International Internship Scholarship in South Korea

Teaching

- 2012-2015 **Master course in KULeuven:** Control Theory Exercise Sessions
- 2012-2015 **Master course in KULeuven:** System Theory Exercise Sessions

Selected Publications

1. **Son, T.D.**, Awatsu L., Hubrechts J., Bhawe A., and Van der Auwerier H., “A simulation-based verification and testing framework for ADAS development”, *Transport Research Arena*, Vienna, 2018
2. Diwale S., **Son, T.D.**, Jones C., “Manifold learning and optimal control for obstacle avoidance in autonomous driving”, *Automatica (submitted)*, 2018
2. **Son, T.D.**, Pipeleers, G., and Swevers, J., “Multi-objective iterative learning control using convex optimization”, *European Journal of Control*, Jan. 2017
3. **Son, T.D.**, Pipeleers, G., and Swevers, J., “Robust monotonic convergent iterative learning control”, *IEEE Transactions on Automatic Control*, Issue 99, Jul. 2015
4. **Son, T.D.**, Ahn, H.S., and Moore, K., “Iterative learning control in optimal tracking problems with specified data points”, *Automatica*, Issue 5, May 2013
5. **Son, T.D.**, Lanh, N., and Van der Auwerier H., “Learning control applications for autonomous driving in extreme maneuver scenarios”, *European Control Conference (ECC19)*, submitted, Naples, June 2019
6. **Son, T.D.**, Bhawe A., and Van der Auwerier H., “Simulation-based testing framework for autonomous driving development”, *IEEE 2019 International Conference on Mechatronics*, Ilmenau, Germany, Mar. 2019
7. Steinhauser, A., **Son, T.D.**, Hostens, E., and Swevers, J., “ROFALT: An Optimization-based Learning Control Tool for Nonlinear Systems”, *The 15th International Workshop on Advanced Motion Control*, Tokyo, Mar. 2018
8. **Son, T.D.**, A., Pipeleers, G., and Swevers, J., and Van der Auwerier H., “A Generalized Frequency Domain Learning Control Design with Experimental Validation”, *The 43rd Annual Conference of the IEEE Industrial Electronics Society*, Beijing, Nov. 2017
9. **Son, T.D.**, Steinhauser, A., Pipeleers, G., and Swevers, J., “Robust performance iterative learning control : Analysis, synthesis and experimental validation”, *The European Control Conference (ECC16)*, Denmark, Jul. 2016
10. **Son, T.D.**, Pipeleers, G., and Swevers, J., “Robust analysis and synthesis with unstructured model uncertainty in lifted system iterative learning control”, *2015 American Control Conference (ACC15)*, Chicago, USA, Jun. 2015
11. **Son, T.D.**, Pipeleers, G., and Swevers, J., “Experimental validation of robust iterative learning control on an overhead crane test setup”, *The 19th World Congress IFAC 2014*, Cape Town, South Africa, Aug. 2014
12. **Son, T.D.**, Pipeleers, G., and Swevers, J., “Robust optimal iterative learning control with model uncertainty”, *The 52nd IEEE Conference on Decision and Control (CDC13)*, Florence, Italy, Dec. 2013

13. **Son, T.D.**, Pipeleers, G., and Swevers, J., “Optimal iterative learning control design with trial-varying initial conditions”, *The European Control Conference (ECC13)*, Zurich, Switzerland, Jul. 2013
14. **Son, T.D.**, Ahn, H.S., “Optimal iterative learning control with uncertain reference points”, *The 2012 IEEE Multi-Conference on Systems and Control*, Dubrovnik, Croatia, Oct. 2012
15. **Son, T.D.**, Ahn, H.S., “Iterative learning control for optimal multiple-point tracking”, *The 50th IEEE Conference on Decision and Control and European Control Conference(CDC-ECC 2011)*, Orlando, USA, Dec. 2011
16. **Son, T.D.**, Ahn, H.S., “An interpolation method of multiple terminal iterative learning control”, *The 2011 IEEE Multi-Conference on Systems and Control (MSC 2011)*, Denver, CO 80202, USA, Sept.. 2011
17. **Son, T.D.**, Ahn, H.S., “Terminal iterative learning control with multiple intermediate pass points”, *The 2011 American Control Conference (ACC11)*, San Francisco, USA (**The Best Presentation in Session Award**), Jun. 2011