

*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) Talks

- 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 several 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
- 2016–Present **Project Management and Supervisor**, Siemens PLM, Belgium.
- Manage control and ADAS/AV projects: project administrator and proposal writing, collaborating with other project 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 of 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.
- 2012–2 **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

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|-------------|--|
| 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<br>PreScan, Vires VTD, Imagine Amesim.Lab, Imagine Embedded Software Designer, L <sup>A</sup> T <sub>E</sub> X, HTML                            |

## Professional Services

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

## Awards

- 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

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## Teaching

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

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

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## 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. 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 (AMC2018)*, Tokyo, Mar. 2018
6. **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 (IECON2017)*, Beijing, Nov. 2017
7. **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
8. **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
9. **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
10. **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
11. **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
12. **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
13. **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
14. **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

15. **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