

## List of Publications

### Books

- [B1] T. Hägglund. *New Estimation Techniques for Adaptive Control*. PhD thesis TFRT-1025, Department of Automatic Control, Lund University, Sweden, December 1983.
- [B2] K. J. Åström and T. Hägglund. *Automatic Tuning of PID Controllers*. Instrument Society of America, Research Triangle Park, North Carolina, 1988.
- [B3] T. Hägglund. *Praktisk Processreglering* (Applied process control). Studentlitteratur, Lund, Sweden, 1990.
- [B4] T. Hägglund. *Process Control in Practice*. Chartwell-Bratt Ltd, Bromley, UK, 1991.
- [B5] K. J. Åström and T. Hägglund. *PID Controllers: Theory, Design, and Tuning*. Instrument Society of America, Research Triangle Park, North Carolina, 1995.
- [B6] T. Hägglund. *Praktisk processreglering (Process control in practice)*. Studentlitteratur, Lund, Sweden, 1997.
- [B7] K. K. Tan, Q. G. Wang, C. C. Hang, and T. Hägglund. *Advances in PID control*. Advances in Industrial Control. Springer Verlag, 1999.
- [B8] K. J. Åström and T. Hägglund. *Advanced PID Control*. ISA - The Instrumentation, Systems, and Automation Society, Research Triangle Park, NC 27709, 2005.
- [B9] T. Hägglund. *Praktisk processreglering* (Applied process control). Studentlitteratur, Lund, Sweden, 2008.
- [B10] K. J. Åström and T. Hägglund. *Control PID Avanzado* (Advanced PID control). Pearson Educación, Madrid, 2009.

### Journal Papers and Book Contributions

- [P1] K. J. Åström and T. Hägglund. "Automatic tuning of simple regulators with specifications on phase and amplitude margins." *Automatica*, **20**, pp. 645–651, 1984.
- [P2] L. Bååth and T. Hägglund. "Autotunern – den flexibla regulatorn (the autotuner – the flexible controller)." *Automation*, **1**, pp. 18–20, 1986.
- [P3] T. Hägglund. "Autotuning, parameterstyrning och framkoppling för bättre processreglering." *Svensk papperstidning*, **3-1989**, pp. 34–38, 1989.
- [P4] T. Hägglund and K. J. Åström. "Industrial adaptive controllers based on frequency response techniques." *Automatica*, **27**, pp. 599–609, 1991.
- [P5] T. Hägglund. "A predictive PI controller for processes with long dead times." *IEEE Control Systems Magazine*, **12:1**, pp. 57–60, 1992.

- [P6] K. J. Åström, T. Hägglund, C. C. Hang, and W. K. Ho. “Automatic tuning and adaptation for PID controllers—A survey.” *Control Engineering Practice*, **1:4**, pp. 699–714, 1993.
- [P7] K. J. Åström, T. Hägglund, and A. Wallenborg. “Automatic tuning of digital controllers with applications to HVAC plants.” *Automatica*, **29**, pp. 1333–1343, 1993.
- [P8] T. Hägglund. “A control-loop performance monitor.” *Control Engineering Practice*, **3**, pp. 1543–1551, 1995.
- [P9] T. Hägglund. “Modern controllers supervise valves automatically.” *InTech*, **43:1**, pp. 44–46, 1996.
- [P10] T. Hägglund and K. J. Åström. “Automatic tuning of PID controllers.” In *The Control Handbook*. CRC Press and IEEE Press, 1996.
- [P11] K. J. Åström and T. Hägglund. “PID control.” In *The Control Handbook*. CRC Press and IEEE Press, 1996.
- [P12] T. Hägglund. “An industrial dead-time compensating PI controller.” *Control Engineering Practice*, **4**, pp. 749–756, 1996.
- [P13] N. F. Thornhill and T. Hägglund. “Detection and diagnosis of oscillation in control loops.” *Control Engineering Practice*, **5:10**, pp. 1343–1354, 1997.
- [P14] K. J. Åström, H. Panagopoulos, and T. Hägglund. “Design of PI controllers based on non-convex optimization.” *Automatica*, **34:5**, pp. 585–601, May 1998.
- [P15] T. Hägglund. “Automatic detection of sluggish control loops.” *Control Engineering Practice*, **7**, pp. 1505–1511, 1999.
- [P16] K. J. Åström and T. Hägglund. “PID control.” In *Control System Fundamentals*. CRC Press, 1999.
- [P17] T. Hägglund and K. J. Åström. “Supervision of adaptive control algorithms.” *Automatica*, **36**, August, pp. 1171–1180, August 2000.
- [P18] R. Rengaswamy, T. Hägglund, and V. Venkatasubramanian. “A qualitative shape analysis formalism for monitoring, control loop performance.” *Engineering Applications of Artificial Intelligence*, **14:1**, pp. 23–33, 2001.
- [P19] K. J. Åström and T. Hägglund. “The future of PID control.” *Control Engineering Practice*, **9**, pp. 1163–1175, 2001.
- [P20] T. Hägglund. “The Blend station - a new ratio control structure.” *Control Engineering Practice*, **9**, pp. 1215–1220, 2001.
- [P21] A. Ingimundarson and T. Hägglund. “Robust tuning procedures of dead-time compensating controllers.” *Control Engineering Practice*, **9**, pp. 1195–1208, 2001.
- [P22] A. Wallén, K. J. Åström, and T. Hägglund. “Loop-shaping design of PID controllers with constant  $T_i/T_d$  ratio.” *Asian Journal of Control*, **4:4**, pp. 403–409, 2002.
- [P23] T. Hägglund. “A friction compensator for pneumatic control valves.” *Journal of Process Control*, **12**, pp. 897–904, 2002.
- [P24] A. Ingimundarson and T. Hägglund. “Performance comparison between PID and dead-time compensating controllers.” *Journal of Process Control*, **12**, pp. 887–895, 2002.

- [P25] A. Isaksson and T. Hägglund. “Editorial – PID control.” *IEEE Proceedings - Control Theory & Applications*, **149:1**, pp. 1 – 2, 2002.
- [P26] H. Panagopoulos, K. J. Åström, and T. Hägglund. “Design of PID controllers based on constrained optimisation.” *IEEE Proceedings - Control Theory & Applications*, **149:1**, pp. 32–40, 2002.
- [P27] T. Hägglund and K. J. Åström. “Revisiting the Ziegler-Nichols tuning rules for PI control.” *Asian Journal of Control*, **4:4**, pp. 364–380, December 2002.
- [P28] M. Petersson, K.-E. Årzén, and T. Hägglund. “A comparison of two feedforward control structure assessment methods.” *International Journal of Adaptive Control and Signal Processing*, **17:7–9**, pp. 609–624, August 2003.
- [P29] T. Hägglund and K. J. Åström. “Revisiting the Ziegler-Nichols step response method for PID control.” *Journal of Process Control*, **14:6**, pp. 635–650, 2004.
- [P30] T. Hägglund and K. J. Åström. “Revisiting the Ziegler-Nichols tuning rules for PI control–part II, the frequency response method.” *Asian Journal of Control*, **6:4**, pp. 469–482, 2004.
- [P31] T. Hägglund. “Book review: Control systems with input and output constraints, by A.H. Glattfelder and W. Schaufelberger.” *Control Engineering Practice*, **13:1**, p. 131, 2005.
- [P32] T. Hägglund. “Industrial implementation of on-line performance monitoring tools.” *Control Engineering Practice*, **13**, pp. 1383–1390, 2005.
- [P33] A. Ingimundarson and T. Hägglund. “Closed-loop performance monitoring using loop tuning.” *Journal of Process Control*, **15:2**, pp. 127–133, 2005.
- [P34] P. Nordfeldt and T. Hägglund. “Decoupler and PID controller design of TITO systems.” *Journal of Process Control*, **16:9**, pp. 923–936, October 2006.
- [P35] P. García, P. Albertos, and T. Hägglund. “Control of unstable non-minimum-phase delayed systems.” *Journal of Process Control*, **16:10**, pp. 1099–1111, December 2006.
- [P36] T. Hägglund. “Automatic on-line estimation of backlash in control loops.” *Journal of Process Control*, **17**, pp. 489–499, 2007.
- [P37] J. L. Guzmán, P. García, T. Hägglund, S. Dormido, P. Albertos, and M. Berenguel. “Interactive tool for analysis of time-delay systems with dead-time compensators.” *Control Engineering Practice*, **16:7**, pp. 824–835, 2008.
- [P38] J. Ekvall and T. Hägglund. “Improved web break strategy using a new approach for steam pressure control in paper machines.” *Control Engineering Practice*, **16:10**, pp. 1151–1160, 2008.
- [P39] J. L. Guzmán, K. J. Åström, S. Dormido, T. Hägglund, M. Berenguel, and Y. Pigué. “Interactive learning modules for PID control.” *IEEE Control Systems Magazine*, October, pp. 118–134, October 2008.
- [P40] K. J. Åström and T. Hägglund. “PID control.” In Levine, Ed., *The Control Handbook, Second Edition: Control System Fundamentals*. CRC Press, December 2010.
- [P41] T. Hägglund and K. J. Åström. “Automatic tuning of PID controllers.” In Levine, Ed., *The Control Handbook, Second Edition: Control System Advanced Methods*. CRC Press, December 2010.

- [P42] J. L. Guzmán and T. Hägglund. “Simple tuning rules for feedforward compensators.” *Journal of Process Control*, **21:1**, pp. 92–102, January 2011.
- [P43] T. Hägglund. “A shape-analysis approach for diagnosis of stiction in control valves.” *Control Engineering Practice*, **19:8**, pp. 782–789, August 2011.
- [P44] J. Garrido, F. Vázquez, F. Morilla, and T. Hägglund. “Practical advantages of inverted decoupling.” *Proceedings of the Institution of Mechanical Engineers, Part I: Journal of Systems and Control*, **225:7**, p. 977–992, November 2011.
- [P45] J. L. Guzmán, T. Hägglund, and A. Visioli. “Feedforward compensation for PID control loops.” In Vilanova and Visioli, Eds., *PID control in the third millenium*. Springer, January 2012.
- [P46] L. Cederqvist, O. Garpinger, T. Hägglund, and A. Robertsson. “Cascade control of the friction stir welding process to seal canisters for spent nuclear fuel.” *Control Engineering Practice*, **20:1**, pp. 35–48, January 2012.
- [P47] H. Wang, T. Hägglund, and Z. Song. “Quantitative analysis of influences of model plant mismatch on control loop behavior.” *Industrial & Engineering Chemistry Research*, **51:49**, pp. 15997–16006, 2012.
- [P48] O. Johnsson, J. Andersson, C. Johnsson, G. Lidén, and T. Hägglund. “A novel feeding strategy for industrial fed-batch processes based on frequency content analysis.” *New Biotechnology*, **29**, 2012.
- [P49] C. Rodríguez, J. L. Guzmán, M. Berenguel, and T. Hägglund. “Generalized feedforward tuning rules for non-realizable delay inversion.” *Journal of Process Control*, **23:9**, pp. 1241–1250, 2013.
- [P50] O. Johnsson, J. Andersson, G. Lidén, C. Johnsson, and T. Hägglund. “Feed rate control in fed-batch fermentations based on frequency content analysis.” *Biotechnology Progress*, **29:3**, pp. 817–824, June 2013.
- [P51] T. Hägglund. “A unified discussion on signal filtering in PID control.” *Control Engineering Practice*, **21:8**, pp. 994–1006, August 2013.
- [P52] K. Soltesz, J.-O. Hahn, T. Hägglund, G. A. Dumont, and J. M. Ansermino. “Individualized closed-loop control of propofol anesthesia: A preliminary study.” *Biomedical Signal Processing and Control*, **8:6**, pp. 500–508, November 2013.
- [P53] O. Garpinger, T. Hägglund, and K. J. Åström. “Performance and robustness trade-offs in pid control.” *Journal of Process Control*, **24:5**, pp. 568–577, 2014.
- [P54] C. Rodríguez, J. L. Guzmán, M. Berenguel, and T. Hägglund. “Optimal feedforward compensators for systems with right-half plane zeros.” *Journal of Process Control*, **24:4**, pp. 368–374, 2014.
- [P55] M. Hast and T. Hägglund. “Low-order feedforward controllers: Optimal performance and practical considerations.” *Journal of Process Control*, **24:9**, pp. 1462–1471, 2014.
- [P56] V. Romero Segovia, T. Hägglund, and K. J. Åström. “Measurement noise filtering for PID controllers.” *Journal of Process Control*, **24:4**, pp. 299–313, 2014.
- [P57] V. Romero Segovia, T. Hägglund, and K. J. Åström. “Measurement noise filtering for common PID tuning rules.” *Control Engineering Practice*, **32**, pp. 43–63, 2014.

- [P58] T. Hägglund. “Autotuning.” In *Encyclopedia of Systems and Control*. Springer London, 2015.
- [P59] A. Theorin and T. Hägglund. “Derivative backoff: The other saturation problem for pid controllers.” *Journal of Process Control*, **33**, 2015.
- [P60] O. Johnsson, D. Sahlin, J. Linde, G. Lidén, and T. Hägglund. “A mid-ranging control strategy for non-stationary processes and its application to dissolved oxygen control in a bioprocess.” *Control Engineering Practice*, **42**, 2015.
- [P61] M. Hast and T. Hägglund. “Optimal proportional–integral–derivative set-point weighting and tuning rules for proportional set-point weights.” *IET Control Theory & Applications*, **9:15**, 2015.
- [P62] O. Garpinger and T. Hägglund. “Software-based optimal pid design with robustness and noise sensitivity constraints.” *Journal of Process Control*, **33:9**, 2015.
- [P63] O. Johnsson, J. Andersson, G. Lidén, C. Johnsson, and T. Hägglund. “Modelling of the oxygen level response to feed rate perturbations in an industrial scale fermentation process.” *Process Biochemistry*, **50:4**, 2015.
- [P64] J. L. Guzmán, T. Hägglund, M. Veronesi, and A. Visioli. “Performance indices for feedforward control.” *Journal of Process Control*, **26**, 2015.
- [P65] J. Berner, T. Hägglund, and K. J. Åström. “Asymmetric relay autotuning - practical features for industrial use.” *Control Engineering Practice*, **54**, 2016.
- [P66] M. Veronesi, J. L. Guzman, A. Visioli, and T. Hägglund. “Closed-loop tuning rules for feedforward compensator gains.” *IFAC-PapersOnLine*, **50:1**, 2017.
- [P67] T. Hägglund. “The tracking ratio station.” *Control Engineering Practice*, **69**, 2017.
- [P68] J. Berner, K. Soltesz, T. Hägglund, and K. J. Åström. “Autotuner identification of tito systems using a single relay feedback experiment.” *IFAC-PapersOnLine*, **50:1**, 2017.
- [P69] P. Mercader, K. J. Åström, A. Banos, and T. Hägglund. “Robust pid design based on qft and convex-concave optimization.” *IEEE Transactions on Control Systems Technology*, **25:2**, 2017.

## Conference Papers

- [C1] T. Hägglund. “Incubation time prediction in youghurt manufacturing.” In *IFAC Workshop on Modeling and Control of Biotechnical Processes*, Helsinki, Finland, 1982.
- [C2] T. Hägglund. “The problem of forgetting old data in recursive estimation.” In *Proceedings of the IFAC Workshop on Adaptive Systems in Control and Signal Processing*, San Francisco, California, 1983.
- [C3] K. J. Åström and T. Hägglund. “Automatic tuning of simple regulators for phase and amplitude margins specifications.” In *Proceedings of the IFAC Workshop on Adaptive Systems in Control and Signal Processing*, San Francisco, California, 1983.

- [C4] T. Hägglund. “Adaptive control of systems subject to large parameter changes.” In *Proc. 9th IFAC World Congress*, Budapest, Hungary, 1984.
- [C5] K. J. Åström and T. Hägglund. “Automatic tuning of simple regulators.” In *Preprints 9th IFAC World Congress*, Budapest, Hungary, 1984.
- [C6] K. J. Åström and T. Hägglund. “A frequency domain approach to analysis and design of simple feedback loops.” In *Proc. 23rd IEEE Conference on Decision and Control*, Las Vegas, Nevada, 1984.
- [C7] T. Hägglund. “Recursive estimation of slowly time varying parameters.” In *Preprints 7th IFAC Symposium on Identification and System Parameter Estimation*, York, UK, 1985.
- [C8] T. Hägglund and K. J. Åström. “Automatic tuning of PID controllers based on dominant pole design.” In *Proceedings of the IFAC Conference on Adaptive Control of Chemical Processes*, Frankfurt, Germany, 1985.
- [C9] T. Karlsson, L. Bååth, and T. Hägglund. “Industrial experiences of autotuning.” In *Control Systems '86 – Symposium on control systems in the pulp and paper industry*, Stockholm, Sweden, 1986.
- [C10] K. J. Åström and T. Hägglund. “A new auto-tuning design.” In *Preprints IFAC Int. Symposium on Adaptive Control of Chemical Processes, ADCHEM '88*, Lyngby, Denmark, 1988.
- [C11] T. Hägglund. “Adaptive PID control.” In *Advances in Process Control II*, Leeds, UK, 1988.
- [C12] T. Hägglund and K. J. Åström. “An industrial adaptive PID controller.” In *IFAC Symposium on Adaptive Control and Signal Processing, ACASP '89*, Glasgow, UK, 1989.
- [C13] K. J. Åström and T. Hägglund. “Practical experiences of adaptive techniques.” In *American Control Conference (ACC '90)*, San Diego, California, 1990.
- [C14] T. Hägglund and K. J. Åström. “A frequency domain approach to adaptive control.” In *Preprints 11th IFAC World Congress*, vol. 4, Tallinn, Estonia, 1990.
- [C15] T. Hägglund and K. J. Åström. “Identification of systems using periodic excitation.” In *9th IFAC/IFORS Symposium on Identification and System Parameter Estimation*, Budapest, Hungary, 1991.
- [C16] T. Hägglund. “A dead-time compensating three-term controller.” In *9th IFAC/IFORS Symposium on Identification and System Parameter Estimation*, Budapest, Hungary, 1991.
- [C17] T. Hägglund. “Level estimation in ships based on fault detection.” In *IFAC/IMACS Symposium on Fault Detection, Supervision and Safety for Technical Processes*, Baden-Baden, FRG, 1991.
- [C18] K. J. Åström, T. Hägglund, C. C. Hang, and W. K. Ho. “Automatic tuning and adaptation for PID controllers—A survey.” In *Preprints 4th IFAC Symposium on Adaptive Systems in Control and Signal Processing*, pp. 121–126, Grenoble, July 1992.
- [C19] K. J. Åström, T. Hägglund, and A. Wallenborg. “Automatic tuning of a digital controller.” In *Preprints 4th IFAC Symposium on Adaptive Systems in Control and Signal Processing*, pp. 445–450, Grenoble, July 1992.

- [C20] T. Hägglund. “Disturbance supervision in feedback loops.” In *Preprints Tooldiag’93, International Conference on Fault Diagnosis*, Toulouse, France, April 1993.
- [C21] T. Hägglund. “Automatic monitoring of control loop performance.” In *Control Systems 94—Conference on Control Systems in the Pulp and Paper Industry*, Stockholm, Sweden, 1994.
- [C22] T. Hägglund. “Automatic supervision of control valves.” In *IFAC Symposium on Fault Detection, Supervision and Safety for Technical Processes*, Helsinki, Finland, 1994.
- [C23] T. Hägglund and A. Tengvall. “An automatic tuning procedure for unsymmetrical processes.” In *European Control Conference*, Rome, Italy, 1995.
- [C24] K. J. Åström and T. Hägglund. “New tuning methods for PID controllers.” In *European Control Conference*, Rome, Italy, 1995.
- [C25] R. Rengaswamy, T. Hägglund, and V. Venkatasubramanian. “A qualitative shape analysis procedure for automatic monitoring of control loop performance.” In *AICheE Annual Meeting*, Miami, USA, 1995.
- [C26] T. Hägglund and K. J. Åström. “Supervision of adaptive control algorithms.” In *IFAC Conference on Control Applications*, Belfort, France, 1997.
- [C27] T. Hägglund. “Stiction compensation in control valves.” In *European Control Conference*, Brussels, Belgium, 1997.
- [C28] H. Panagopoulos, K. J. Åström, and T. Hägglund. “A numerical method for design of PI controllers.” In *IEEE Conference on Control Applications*, Hartford, Connecticut, 1997.
- [C29] P. Brath, H. Rasmussen, and T. Hägglund. “Control of the outlet air temperature in an air handling unit.” In *International Conference on Control’98*, Swansea, UK, 1998.
- [C30] H. Panagopoulos, K. J. Åström, and T. Hägglund. “Design of PID controllers based on constrained optimization.” In *Proc. 1999 American Control Conference (ACC’99)*, pp. 3858–3862, San Diego, California, June 1999.
- [C31] A. Ingimundarson and T. Hägglund. “Robust automatic tuning of an industrial PI controller for dead-time systems.” In *IFAC Workshop on Digital Control – Past, present, and future of PID Control*, Terrassa, Spain, 2000.
- [C32] K. J. Åström and T. Hägglund. “Benchmark systems for PID control.” In *IFAC Workshop on Digital Control – Past, present, and future of PID Control*, Terrassa, Spain, 2000.
- [C33] K. J. Åström and T. Hägglund. “The future of PID control.” In *IFAC Workshop on Digital Control – Past, present, and future of PID Control*, Terrassa, Spain, 2000.
- [C34] T. Hägglund. “A new ratio control structure.” In *IFAC Workshop on Digital Control – Past, present, and future of PID Control*, Terrassa, Spain, 2000.
- [C35] K. H. Johansson and T. Hägglund. “Control structure design in process control systems.” In *ADCHEM 2000, IFAC International Symposium on Advanced Control of Chemical Processes*, Pisa, Italy, 2000.

- [C36] A. Ingimundarson and T. Hägglund. “Closed-loop identification of first-order plus dead-time model with method of moments.” In *ADCHEM 2000, IFAC International Symposium on Advanced Control of Chemical Processes*, Pisa, Italy, 2000.
- [C37] H. Panagopoulos and T. Hägglund. “A new modular approach to active control of undamped modes.” In *Reglermöte 2000, Uppsala University*, Uppsala, Sweden, 2000.
- [C38] M. Petersson, K.-E. Årzén, and T. Hägglund. “Assessing measurements for feed-forward control.” In *ECC 2001*, Porto, Portugal, September 2001.
- [C39] T. Hägglund. “Industrial applications of automatic performance monitoring tools.” In *IFAC World Congress*, Barcelona, Spain, 2002.
- [C40] S. Ericsson, T. Hägglund, and P. Rudfjäll. “Implementation of an on-line detection procedure for oscillating control loops.” In *Control Systems 2002*, Stockholm, Sweden, 2002.
- [C41] O. Slätteke, K. Forsman, T. Hägglund, and B. Wittenmark. “On identification and control tuning of cylinder dryers.” In *Proceedings Control Systems 2002*, pp. 298–302, Stockholm, June 2002.
- [C42] M. Petersson, L. Pernebo, B. Hansson, K.-E. Årzén, and T. Hägglund. “Control structure assessment in an industrial control system.” In *Control Systems 2002*, Stockholm, Sweden, June 2002.
- [C43] A. Ingimundarson, T. Hägglund, and K. J. Åström. “Criteria for design of PID controllers.” In *Proceedings of the 2nd IFAC conference Control System Design, CSD’03*, Bratislava, Slovak Republic, 2003.
- [C44] J. Ekvall and T. Hägglund. “Steam pressure control during web breaks in the paper machine.” In *Control Systems 2004*, Quebec City, Canada, 2004.
- [C45] P. Nordfeldt and T. Hägglund. “Design of PID controllers for decoupled multi-variable systems.” In *Proc. 16th IFAC World Congress*, Prague, Czech Republic, July 2005.
- [C46] J. L. Guzmán, P. García, T. Hägglund, S. Dormido, P. Albertos, and M. Berenguel. “Interactive tool for analysis of time-delay systems with dead-time compensation.” In *7th IFAC Symposium on Advances in Control Education*, Madrid, Spain, June 2006.
- [C47] M. Karlsson, O. Slätteke, T. Hägglund, and S. Stenström. “Feedforward control in the paper machine drying section.” In *American Control Conference 2006*, Minneapolis, Minnesota, USA, June 2006.
- [C48] J. L. Guzmán, K. J. Åström, S. Dormido, T. Hägglund, and Y. Piguet. “Interactive learning modules for PID control.” In *7th IFAC Symposium on Advances in Control Education*, Madrid, Spain, June 2006.
- [C49] B. Schofield, T. Hägglund, and A. Rantzer. “Vehicle dynamics control and controller allocation for rollover prevention.” In *Proceedings of the IEEE International Conference on Control Applications*, Munich, Germany, October 2006.
- [C50] B. Schofield and T. Hägglund. “Optimal control allocation in vehicle dynamics control for rollover mitigation.” In *2008 American Control Conference*, Seattle, Washington, USA, June 2008.



- [C51] O. Garpinger and T. Hägglund. “A software tool for robust PID design.” In *Proc. 17th IFAC World Congress, Seoul, Korea, July 2008*.
- [C52] P.-O. Larsson and T. Hägglund. “Relations between control signal properties and robustness measures.” In *17th IFAC World Congress, Seoul, Korea, July 2008*.
- [C53] J. L. Guzmán, K. J. Åström, S. Dormido, T. Hägglund, Y. Piguet, and M. Berenguel. “Interactive learning module: Basic modelling and identification concepts.” In *17th IFAC World Congress, Seoul, Korea, July 2008*.
- [C54] P.-O. Larsson and T. Hägglund. “Robustness margins separating process dynamics uncertainties.” In *2009 European Control Conference, Budapest, Hungary, August 2009*.
- [C55] J. L. Guzmán, K. J. Åström, T. Hägglund, S. Dormido, M. Berenguel, and Y. Piguet. “Interactive learning module for control interaction understanding.” In *European Control Conference, Budapest, Hungary, August 2009*.
- [C56] K. Soltesz, T. Hägglund, and K. J. Åström. “Transfer function parameter identification by modified relay feedback.” In *2010 American Control Conference, Baltimore, Maryland, USA, June 2010*.
- [C57] L. Cederqvist, O. Garpinger, T. Hägglund, and A. Robertsson. “Cascaded control of power input and welding temperature during sealing of spent nuclear fuel canisters.” In *Proc. ASME Dynamic Systems and Control Conference, Cambridge, Massachusetts, September 2010*.
- [C58] P.-O. Larsson and T. Hägglund. “Control signal constraints and filter order selection for PI and PID controllers.” In *2011 American Control Conference, San Francisco, California, USA, June 2011*.
- [C59] J. L. Guzmán, T. Hägglund, K. J. Åström, S. Dormido, M. Berenguel, and Y. Piguet. “Feedforward control concepts through interactive tools.” In *18th IFAC World Congress, Milano, Italy, August 2011*.
- [C60] K. Soltesz and T. Hägglund. “Extending the relay feedback experiment.” In *18th IFAC World Congress, Milano, Italy, August 2011*.
- [C61] K. Soltesz, C. Johnsson, and T. Hägglund. “Teaching control principles to industry practitioners.” In *SEFI Annual Conference 2011, Lisbon, Portugal, September 2011*.
- [C62] A. Lindholm, C. Johnsson, T. Hägglund, and H. Carlsson. “Reducing revenue loss due to disturbances in utilities using buffer tanks —A case study at Perstorp.” In *Conference on Foundations of Computer-Aided Process Operations (FOCAPO2012), Savannah, Georgia, USA, January 2012*.
- [C63] O. Garpinger, T. Hägglund, and K. J. Åström. “Criteria and trade-offs in PID design.” In *IFAC Conference on Advances in PID Control, Brescia, Italy, March 2012*.
- [C64] O. Garpinger, T. Hägglund, and L. Cederqvist. “Software for PID design: benefits and pitfalls.” In *IFAC Conference on Advances in PID Control, Brescia, Italy, March 2012*.
- [C65] M. Hast and T. Hägglund. “Design of optimal low-order feedforward controllers.” In *IFAC Conference on Advances in PID Control, Brescia, Italy, March 2012*.

- [C66] K. Soltesz, K. van Heusden, G. A. Dumont, T. Hägglund, C. Petersen, N. West, and J. M. Ansermino. "Closed-loop anesthesia in children using a PID controller: A pilot study." In *IFAC Conference on Advances in PID Control*, Brescia, Italy, March 2012.
- [C67] T. Hägglund. "Signal filtering in PID control." In *IFAC Conference on Advances in PID Control*, Brescia, Italy, March 2012.
- [C68] P.-O. Larsson and T. Hägglund. "Comparison between robust PID and predictive PI controllers with constrained control signal noise sensitivity." In *IFAC Conference on Advances in PID Control*, Brescia, Italy, March 2012. Accepted for publication.
- [C69] K. Soltesz, G. A. Dumont, K. van Heusden, T. Hägglund, and J. M. Ansermino. "Simulated mid-ranging control of Propofol and Remifentanyl using EEG-measured hypnotic depth of anesthesia." In *51st IEEE Conference on Decision and Control*, Maui, Hawaii, USA, December 2012.
- [C70] O. Johnsson, J. Andersson, C. Johnsson, G. Lidén, and T. Hägglund. "A novel feeding strategy for industrial fed-batch processes based on frequency content analysis." In *15th European Congress on Biotechnology*, Istanbul, Turkey, September 2012.
- [C71] V. Romero Segovia, T. Hägglund, and K. J. Åström. "Noise filtering in PI and PID control." In *2013 American Control Conference*, Washington DC, USA, June 2013.
- [C72] C. Rodríguez, J. L. Guzmán, M. Berenguel, T. Hägglund, and J. E. Normey-Rico. "Diseño de controladores por adelanto para inversión de retardo no realizable." In *XXXIV Jornadas de Automática*, Terrassa, Spain, September 2013.
- [C73] J. Berner, K. J. Åström, and T. Hägglund. "Towards a new generation of relay autotuners." In *19th IFAC World Congress*, Cape Town, South Africa, August 2014.
- [C74] J. L. Guzmán, T. Hägglund, K. J. Åström, S. Dormido, M. Berenguel, and Y. Piquet. "Understanding PID design through interactive tools." In *19th IFAC World Congress*, Cape Town, South Africa, August 2014.
- [C75] O. Garpinger and T. Hägglund. "Modeling for optimal PID design." In *19th IFAC World Congress*, Cape Town, South Africa, August 2014.
- [C76] V. Romero Segovia, T. Hägglund, and K. J. Åström. "Design of measurement noise filters for PID control." In *19th IFAC World Congress*, Cape Town, South Africa, August 2014.
- [C77] J. Berner, T. Hägglund, and K. J. Åström. "Improved relay autotuning using normalized time delay." In *American Control Conference, 2016*, 2016.
- [C78] V. Rodrigo, M. Chioua, T. Hägglund, and M. Hollender. "Causal analysis for alarm flood reduction." In *IFAC Symposium on Dynamics and Control of Process Systems (DYCOPS) 2016*, 2016.
- [C79] J. Berner, K. Soltesz, K. J. Åström, and T. Hägglund. "Practical evaluation of a novel multivariable relay autotuner with short and efficient excitation." In *IEEE Conference on Control Technology and Applications, CCTA 2017*, 2017.

## Patents

Förfarande för inställning av en PID-regulator för en process.  
(Method and an apparatus in tuning a PID-regulator).

Sweden 8104989-2, 1983-07-21

USA 4,549,123, 1985-10-22

Canada 1 201 511, 1986-03-04

Finland 71435, 1986-12-19

Denmark 159343, 1983-07-21

Norway 160632, 1989-06-05

Förfarande och anordning för inställning av en digital regulator.  
(Method and an apparatus for automatically tuning a process regulator).

Sweden 8501665-7, 1987-03-05

USA 4,758,943, 1988-07-19

Förfarande samt reglersystem för friktionskompensation.  
(Method and control system for compensating for friction).

Sweden 9503286-8, 1997-03-17

USA 6,285,913, 2001-09-04

Reglersystem och förfarande för kvotstyrning.  
(Control system and method for ratio control).

Sweden 9901336-9, 2000-06-13

En metod och ett system för utvärdering av huruvida en signal är lämplig för framkopplingsreglering.  
(A method and a system for evaluation whether a signal is suitable for feed-forward control).

Sweden 0004171-S, 2003-07-01

Canada 2 428 691, 2002-05-23

USA 6,937,910, 2005-08-30

Automatisk uppskattning av glapp.  
(Automatic backlash estimation.)

Sweden SE 530 380, 2008-05-20

Germany DE 11 2007 002 356 T5, 2009-07-23

USA US 20090248180 A1, 2009-10-01

China CN 101523314 A, 2009-11-02

France WO 2008040728 A1, 2008-04-10