

CURRICULUM VITAE

Hassan K. Khalil

Department of Electrical and Computer Engineering

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Education Ph.D. (1978), University of Illinois (P.V. Kokotovic, thesis advisor), M.S. (1975) and B.S. (1973), Cairo University.

Professional Experience

2003 –	University Distinguished Professor, Electrical and Computer Eng., MSU
1987 – 2003	Professor, Electrical and Computer Engineering, MSU
1983 – 1987	Associate Professor, Electrical Engineering, MSU
1978 – 1983	Assistant Professor, Electrical Engineering, MSU
1975 – 1978	Research Assistant, Electrical Engineering, Univ. of Illinois, Urbana
1973 – 1975	Teaching Assistant, Electronics and Communication, Cairo Univ.

Research Interest

Nonlinear Control; Singular Perturbation Theory

Honors

- Fellow of the Institute of Electrical and Electronics Engineers (IEEE), 1989, for contributions to singular perturbation theory and its application to control.
- Fellow of the International Federation of Automatic Control (IFAC), 2007, for contribution to singular perturbation theory, nonlinear feedback control and control education.
- George S. Axelby Outstanding Paper Award, IEEE Control Systems Society, 1989.
- John R. Ragazzini Education Award, American Automatic Control Council, 2000.
- Control Engineering Textbook Prize, IFAC, 2002.
- O. Hugo Schuck Best Paper Award, American Control Conference, 2004.
- AGEF Faculty Mentor of the Year Award, 2009.
- The Journal Dynamics of Continuous, Discrete & Impulsive Systems published two special issues in December 2010 in honor of Professor Hassan K. Khalil's 60th birthday. One issue is under series A: Mathematical Analysis and the other under series B: Applications & Algorithms.
- Bode Lecture Prize, IEEE Control Systems Society, 2015

Honors (Michigan State University)

- Teacher Scholar Award, 1983.
- Withrow Distinguished Scholar Award, College of Engineering, 1994.
- Distinguished Faculty Award, 1995.
- University Distinguished Professor, 2003.

Technical and Professional Activities

- Associate Editor of IEEE Transactions on Automatic Control, 1984 - 1985, Automatica, 1992 – 1999, and Neural Networks, 1997-1998; Editor of Automatica, 1999 – 2008.
- Active in the organization of the IEEE-CDC Conference and the American Control Conference (ACC), including service as Program Chair of the 1988 ACC and General Chair of the 1994 ACC.

Industrial Consulting

- General Motors Research Laboratories, 1984 – 1988.
- Delco Products (GM), 1989–1991.
- General Motors R&D Center, 1993–1994.

Research Projects Funded by External Agencies

- Continuous funding from the National Science Foundation from 1979 to 2017. Topics include singular perturbations, decentralized control, feedback control of multiple time scale systems, nonlinear output feedback control: performance and robustness, and High-Gain Observers in Nonlinear Feedback Control.
- A contract with the U.S. Department of Energy from 1980 to 1983 on multimodel strategies for stochastic models.
- Funding from Ford Motor Company (with E. Strangas) from 1995 to 2001. Topics include robust AC motor control with minimal sensor requirements and fault diagnosis for DC distribution systems.
- A combined research curriculum development grant from the National Science Foundation from 1997 to 2000 (with F. Salam, C. Radcliffe, S. Shaw, and R.L. Tummala) on real-time sensing and control computing for automotive systems. The main goal of the grant is the development of a pilot senior-level course on automotive control which incorporates advanced nonlinear and intelligent control tools.

- Funding from the National Science Foundation from 2008 to 2011 (with X. Tan) on nonlinear and adaptive control of smart material-actuated systems with application to nanopositioning.
- Funding from National Science Foundation from from 2015 to 2018 (with R. Mukherjee) on impulsive control of underactuated mechanical systems.

Ph.D. Students

- Mohamed Gamal El-Ansary, 1983; professor, California State University, Bakersfield.
- Ali Saberi, 1983; professor, Washington State University; Fellow of IEEE and author of three research monographs.
- Douglas William Luse, 1983; industrial engineer, USA.
- Bakhtiar Litkouhi, 1984; senior staff engineer, General Motors R&D Center.
- Zoran Gajic, 1984; professor, Rutgers University; author of three research monographs and two textbooks.
- Yung-Nan Hu, 1986; associate professor, Da Yeh University, Taiwan.
- Rabah Wasel Aldhaheeri, 1988; professor, King Abdul-Aziz University, Saudi Arabia.
- Farzad Esfandiari, 1990; engineer, Motorola, USA.
- Fu-Chuang Chen, 1990; associate professor, National Chiao Tung University, Taiwan.
- Seungrohk Oh, 1994; associate professor, Dankook University, Korea.
- Nazmi A. Mahmoud, 1994; engineer, Chrysler, USA.
- Ahmed Nazir Atassi, 1999.
- Bader Aloliwi, 1999, assistant professor, Saudi Arabia.
- Ahmed M. Dabroom, 2000, assistant professor, Saudi Arabia.
- Hyon Sok Kay, 2003; engineer, Samsung, Korea.
- Sridhar Seshagiri, 2003; associate professor, San Diego State University.
- Leonid Freidovich, 2005; assistant professor; University of Umea, Sweden
- Jeff Ahrens, 2006; engineer, Corning, USA
- Attaullah Memon, 2009; assistant professor, NUST, Pakistan

- Shahid Nazrula, 2010; engineer, Chrysler, USA
- Alexis Prasov, 2011; researcher, MIT Lincoln Lab
- Mohamed Edardar, 2013; assistant professor, Lybia
- AlMuatazbellah M. Boker, 2013, assistant professor, Marshall University, USA
- Joonho Lee, 2014, research engineer, HRL Laboratories, USA

Books

- P.V. Kokotovic, H.K. Khalil and J. O'Reilly, *Singular Perturbation Methods in Control: Analysis and Design*. Academic Press, 1986. Republished by SIAM under the Classics in Applied Mathematics series, 1999.
- H.K. Khalil, *Nonlinear Systems*. Macmillan, 1992; Prentice Hall, 1996 (second edition), 2002 (third edition). The second edition received the IFAC Control Engineering Textbook Award, 2002.
- H.K. Khalil, *Nonlinear Control*. Pearson Education, 2015.
- H.K. Khalil, *High-Gain Observers in Nonlinear Feedback Control*. SIAM, 2017.
- P.V. Kokotovic and H. K. Khalil, Editors, *Singular Perturbation in Systems and Control*. IEEE Press, 1986.
- H. Khalil, J. Chow and P. Ioannou, Editors, *Proceedings of Workshop on Advances in Control and its Applications*. Springer-Verlag, 1996.

Technical Publications (Refereed Journals)

1. H.K. Khalil. Control of linear singularly perturbed systems with colored noise disturbance. *Automatica*, 14, 153–156, 1978.
2. H.K. Khalil and P.V. Kokotovic. Control strategies for decision makers using different models of the same system. *IEEE Trans. Automat. Contr.*, AC-23, 289–298, 1978.
3. H.K. Khalil and P.V. Kokotovic. D-stability and multiparameter singular perturbation. *SIAM J. Control and Optimization*, 17, 56–65, 1979.
4. H.K. Khalil and P.V. Kokotovic. Control of linear systems with multiparameter singular perturbations. *Automatica*, 15, 197–207, 1979.
5. H.K. Khalil and P.V. Kokotovic. Feedback and well-posedness of singularly perturbed Nash games. *IEEE Trans. Automat. Contr.*, AC-24, 699–708, 1979.
6. H.K. Khalil. Stabilization of multiparameter singularly perturbed systems, *IEEE Trans. Automat. Contr.* AC-24, 790–791, 1979.

7. H.K. Khalil and J. Medanic. Closed-loop Stackelberg strategies for singularly perturbed linear quadratic problems. *IEEE Trans. Automat. Contr.*, AC-25, 66–71, 1980.
8. H.K. Khalil. Approximation of Nash strategies. *IEEE Trans. Automat. Contr.*, AC-25, 247–250, 1980.
9. H.K. Khalil and P.V. Kokotovic. Decentralized stabilization of systems with slow and fast modes. *J. Large Scale Systems*, 1, 141–148, 1980.
10. H.K. Khalil. A new test for D-stability. *J. Economic Theory*, 23, 120–122, 1980.
11. H.K. Khalil. Multimodel design of a Nash strategy. *J. Optimization Theory and Applications*, 31, 553–564, 1980.
12. H.K. Khalil. On the robustness of output feedback control methods to modeling errors. *IEEE Trans. Automat. Contr.*, AC-26, 524–526, 1981.
13. H.K. Khalil. Asymptotic stability of nonlinear multiparameter singularly perturbed systems. *Automatica*, 17, 797–804, 1981.
14. H.K. Khalil. On the existence of positive diagonal P such that $PA + AP < 0$. *IEEE Trans. Automat. Contr.*, AC-27, 181–184, 1982.
15. H.K. Khalil and A. Saberi. Decentralized stabilization of nonlinear interconnected systems using high-gain feedback. *IEEE Trans. Automat. Contr.*, AC-17, 265–268, 1982.
16. A. Saberi and H.K. Khalil. Decentralized stabilization of a class of nonlinear interconnected systems. *Int. J. Control*, 36, 803–818, 1982.
17. B. Litkouhi and H K. Khalil. Infinite-time regulators for singularly perturbed difference equations. *Int. J. Control*, 39, 587–598, 1984.
18. A. Saberi and H.K. Khalil. Quadratic-type Lyapunov functions for singularly perturbed systems. *IEEE Trans. Automat. Contr.*, AC-29, 542–552, 1984.
19. H.K. Khalil and Z. Gajic. Near-optimum regulators for stochastic linear singularly perturbed systems. *IEEE Trans. Automat. Contr.*, AC-29, 531–541, 1984.
20. H.K. Khalil. A further note on the robustness of output feedback control methods to modeling errors. *IEEE Trans. Automat. Contr.*, AC-29, 861–862, 1984.
21. H.K. Khalil. Time scale decomposition of linear implicit singularly perturbed systems. *IEEE Trans. Automat. Contr.*, AC-29, 1054–1056, 1984.
22. A. Saberi and H.K. Khalil. An initial value theorem for nonlinear singularly perturbed systems. *Systems and Control Letters*, 4, 301–305, 1984.

23. A. Saberi and H.K. Khalil. Decentralized stabilization of interconnected systems using output feedback. *Int. J. Control*, 41, 1461–1475, 1985.
24. B. Litkouhi and H K. Khalil. Multirate and composite control of two-time-scale discrete-time systems. *IEEE Trans. Automat. Contr.*, AC-30, 645–651, 1985.
25. A. Saberi and H.K. Khalil. Stabilization and regulation of nonlinear singularly perturbed systems-composite control. *IEEE Trans. Automat. Contr.*, AC-30, 739–747, 1985.
26. D.W. Luse and H.K. Khalil. Frequency domain results for systems with slow and fast dynamics. *IEEE Trans. Automat. Contr.*, AC-30, 1171–1178, 1985.
27. M. El-Ansary and H.K. Khalil. On the interplay of singular perturbations and wide-band stochastic fluctuations. *SIAM J. on Control and Optimization*, 24, 83–94, 1986.
28. Z. Gajic and H.K. Khalil. Multimodel strategies under random disturbances and imperfect partial observations. *Automatica*, 22, Jan. 1986.
29. H.K. Khalil. Stability analysis of nonlinear multiparameter singularly perturbed systems. *IEEE Trans. Automat. Contr.*, AC-32, 260–263, 1987.
30. H.K. Khalil. Output feedback control of linear two-time-scale systems. *IEEE Trans. Automat. Contr.*, AC-32, 784–792, 1987.
31. H.K. Khalil and A. Saberi. Adaptive stabilization of a class of nonlinear systems using high-gain feedback. *IEEE Trans. Automat. Contr.*, AC-32, 1031–1035, 1987.
32. H.K. Khalil and Y.-N. Hu. Steering control of singularly perturbed systems: a composite control approach. *Automatica.*, vol. 25, pp. 65–75, 1989.
33. R.W. Aldhaferi and H.K. Khalil. A Real Schur form method for modeling singularly perturbed systems. *IEEE Trans. Automat. Contr.*, vol. 34, 856–861, 1989.
34. F. Esfandiari and H.K. Khalil. On the robustness of sampled-data control to unmodeled high-frequency dynamics. *IEEE Trans. Automat. Contr.*, vol. 34, 900–903, 1989.
35. H.K. Khalil. Feedback control of nonstandard singularly perturbed systems. *IEEE Trans. Automat. Contr.*, vol. 34, 1052–1060, 1989.
36. F.-C. Chen and H.K. Khalil. Two-time-scale longitudinal control of airplanes using singular perturbation. *AIAA J. on Guidance, Control, and Dynamics*, vol. 13, 952–960, 1990.
37. H.K. Khalil and P.V. Kokotovic. On stability properties of nonlinear systems with slowly-varying inputs. *IEEE Trans. Automat. Contr.*, vol. 36, 229, 1991.

38. R.W. Aldhaferi and H.K. Khalil. Aggregation of the policy iteration method for nearly completely decomposable Markov chains. *IEEE Trans. Automat. Contr.*, vol. 36, 178–187, 1991.
39. F. Esfandiari and H.K. Khalil. On continuous approximations to variable structure control. *IEEE Trans. Automat. Contr.*, vol. 36, 616–620, 1991.
40. F.-C. Chen and H.K. Khalil. Adaptive control of nonlinear systems using neural networks. *Int. J. Control*, vol. 55, 1299–1317, 1992.
41. F. Esfandiari and H.K. Khalil. Output feedback stabilization of fully linearizable systems. *Int. J. Control*, vol. 56, 1007–1037, 1992.
42. H.K. Khalil and F.-C. Chen. H-infinity control of two-time-scale systems. *Systems and Control Letters*, vol. 19, 35–42, 1992.
43. H.K. Khalil and F. Esfandiari. Semiglobal stabilization of a class of nonlinear systems using output feedback. *IEEE Trans. Automat. Contr.*, vol. 38, 1412–1415, 1993.
44. H.K. Khalil. Robust servomechanism output feedback controllers for feedback linearizable systems. *Automatica*, vol. 30, 1587–1599, 1994.
45. F.-C. Chen and H.K. Khalil. Adaptive control of a class of nonlinear discrete-time systems using neural networks. *IEEE Trans. Automat. Contr.* vol. 40, 791–801, 1995.
46. S. Oh and H.K. Khalil. Output feedback stabilization using variable structure control. *Int. J. Control*, vol. 62, 831–848, 1995.
47. H.K. Khalil. Adaptive output feedback control of nonlinear systems represented by input-output models. *IEEE Trans. Automat. Contr.*, vol. 41, 177–188, 1996.
48. H.K. Khalil and E.G. Strangas. Robust speed control of induction motors using position and current measurements. *IEEE Trans. Automat. Contr.*, vol. 41, 1216–1220, 1996.
49. R.W. Aldhaferi and H.K. Khalil. Effect of unmodeled dynamics on output feedback stabilization of nonlinear systems. *Automatica*, vol. 32, 1323–1327, 1996.
50. N. Mahmoud and H.K. Khalil. Asymptotic regulation of minimum phase nonlinear systems using output feedback. *IEEE Trans. Automat. Contr.*, vol. 41, 1402–1412, 1996.
51. N. Mahmoud and H.K. Khalil. Robust control for a nonlinear servomechanism problem. *Int. J. Control*, vol. 66, 779–802, 1997.
52. K.W. Lee and H.K. Khalil. Adaptive output feedback control of robot manipulators using high-gain observers. *Int. J. Control*, vol. 67, 869–886, 1997.

53. S. Oh and H.K. Khalil. Nonlinear output feedback tracking using high-gain observer and variable structure control. *Automatica*, vol. 33, 1845–1856, 1997.
54. B. Aloliwi and H.K. Khalil. Robust adaptive output feedback control of nonlinear systems without persistence of excitation. *Automatica*, vol. 33, 2025–2032, 1997.
55. B. Aloliwi and H.K. Khalil. Adaptive output feedback regulation of a class of nonlinear systems: convergence and robustness. *IEEE Trans. Automat. Contr.*, vol. 42, 1714–1716, 1997.
56. M. Djemai, J.P. Barbot, and H.K. Khalil. Digital multi-rate control for a class of nonlinear singularly perturbed systems. *Int. J. Control*, vol. 72, 851–865, 1999.
57. A.N. Atassi and H.K. Khalil. A separation principle for the stabilization of a class of nonlinear systems. *IEEE Trans. Automat. Contr.*, vol. 44, 1672–1687, 1999.
58. A. Dabroom and H.K. Khalil. Discrete-time implementation of high-gain observers for numerical differentiation. *Int. J. Control*, vol. 72, 1523–1537, 1999.
59. E.G. Strangas, H.K. Khalil, B. Aloliwi, L. Laubinger, and J. Miller. Robust tracking controllers for induction motors without rotor position sensor: analysis and experimental results. *IEEE Trans. on Energy Conversion*, vol. 14, 1448–1458, 1999.
60. S. Seshagiri and H.K. Khalil. Output feedback control of nonlinear systems using RBF neural networks. *IEEE Trans. on Neural Networks*, vol. 11, 69–79, 2000.
61. H.K. Khalil. Universal integral controllers for minimum phase nonlinear systems. *IEEE Trans. Automat. Contr.*, vol. 45, 490–494, 2000.
62. A.N. Atassi and H.K. Khalil. Separation results for the stabilization of nonlinear systems using different high-gain observer designs. *Systems & Control Letters*, vol. 39, 183–191, 2000.
63. B. Aloliwi, H.K. Khalil, and E.G. Strangas. Robust speed control of induction motors: application to a benchmark example. *Int. J. Adaptive Control and Signal Processing*, vol. 14, 157–170, 2000.
64. S.-L.Chen, S.W. Shaw, H.K. Khalil, and A.W. Troesch. Robust stabilization of large amplitude ship rolling in beam seas. *J. of Dyn. Sys., Meas., and Contr.*, 122, 108–113, 2000.
65. H.K. Khalil. On the design of robust servomechanisms for minimum phase nonlinear systems. *Int. J. Robust and Nonlinear Control*, vol. 10, 339–361, 2000.
66. A.N. Atassi and H.K. Khalil. A separation principle for the control of a class of nonlinear systems. *IEEE Trans. Automat. Contr.*, vol. 46, 742–746, 2001.

67. A.M. Dabroom and H.K. Khalil. Output feedback sampled-data control of nonlinear systems using high-gain observers, *IEEE Trans. Automat. Contr.*, vol. 46, 1712–1725, 2001.
68. M.S. Mahmoud and H.K. Khalil. Robustness of high-gain observer-based nonlinear controllers to unmodeled actuators and sensors. *Automatica*, vol. 38, 361–369, 2002.
69. H.K. Khalil. Improved performance of universal integral regulators. *J. Optimization Theory and Applications*, vol. 115, 571–586, 2002.
70. H.K. Khalil. Performance recovery under output feedback sampled-data stabilization of a class of nonlinear systems. *IEEE Trans. Automat. Contr.*, vol. 49, 2173–2184, 2004.
71. H.S. Kay and H.K. Khalil. Universal integral controllers with non-linear integral gains. *Int. J. Control*, vol. 77, 1521–1531, 2004.
72. S. Seshagiri and H.K. Khalil. Robust output feedback regulation of minimum-phase nonlinear systems using conditional integrators. *Automatica*, vol. 41, 43–54, 2005.
73. W.G. Zanardelli, E.G. Strangas, H.K. Khalil, and J.M. Miller. Wavelet-based methods for the prognosis of mechanical and electrical failures in electric motors. *Mechanical Systems and Signal Processing*, vol. 19, 411–426, 2005.
74. S. Seshagiri and H.K. Khalil. Robust output regulation of minimum phase nonlinear systems using conditional servocompensators. *Int. J. Robust and Nonlinear Control*, vol. 15, 83–102, 2005.
75. A. Singh and H.K. Khalil. Regulation of nonlinear systems using conditional integrators. *Int. J. Robust and Nonlinear Control*, vol. 15, 339–362, 2005.
76. L.B. Freidovich and H.K. Khalil. Logic-based switching for the robust control of minimum-phase nonlinear systems. *Systems & Control Letters*, vol. 54, 713–727, 2005.
77. H.K. Khalil. A note on the robustness of high-gain-observer-based controllers to unmodeled actuator and sensor dynamics. *Automatica*, vol. 41, 1821–1824, 2005.
78. T.H. Kandil, H.K. Khalil, J. Vincent, T.L. Grimm, W. Hartung, J. Popielarski, R.C. York, and S. Seshagiri. Adaptive feedforward cancellation of sinusoidal disturbances in superconducting RF cavities. *Nuclear Instruments & Methods In Physics Research Section A-Accelerators Spectrometers Detectors and Associated Equipment*, vol. 550, 514–520, 2005.
79. L.B. Freidovich and H.K. Khalil. Lyapunov-based switching control of nonlinear systems using high-gain observers. *Automatica*, vol. 43, 150–157, 2007.

80. J. Ahrens and H.K. Khalil. Closed-Loop Behavior of a Class of Nonlinear Systems Under EKF-based Control. *IEEE Trans. Automat. Contr.*, vol. 52, 536–540, 2007.
81. L.K. Vasiljevic and H.K. Khalil. Error bounds in differentiation of noisy signals by high-gain observers. *Systems & Control Letters*, vol. 57, 856–862, 2008.
82. L.B. Freidovich and H.K. Khalil. Performance recovery of feedback-linearization-based designs. *IEEE Trans. Automat. Contr.*, vol. 53, 2324–2334, 2008.
83. J. Ahrens and H.K. Khalil. High-gain observers in the presence of measurement noise: A switched-gain approach. *Automatica*, vol. 45, 936–943, 2009.
84. H.K. Khalil and E.G. Strangas and S. Jurkovic. Speed observer and reduced nonlinear model for sensorless control of induction motors. *IEEE Trans. Contr. Syst. Tech.*, vol. 17, 327–339, 2009.
85. J.H. Ahrens and X. Tan and H.K. Khalil. Multirate sampled-data output feedback control with application to smart material actuated systems. *IEEE Trans. Automat. Contr.*, vol. 54, 2518–2529, 2009.
86. H.K. Khalil. Analysis of Sampled-Data High-Gain Observers in the Presence of Measurement Noise. *European Journal Of Control*, vol. 15, 166–176, 2009.
87. K. Ma and H.K. Khalil. On the Transient Response of a Nonlinear Output Regulator. *IEEE Trans. Automat. Contr.*, vol. 55, 1455–1460, 2010.
88. A.Y. Memon and H.K. Khalil. Output Regulation of Nonlinear Systems Using Conditional Servocompensators. *Automatica*, vol. 46, 1119–1128, 2010.
89. M.S. Nazrulla and H.K. Khalil. Robust stabilization of non-minimum phase nonlinear systems using extended high gain observers. *IEEE Trans. Automat. Contr.*, vol. 56, 802–813, 2011.
90. J. Liu, H.K. Khalil, and K.G. Oweiss. Model-based analysis and control of a network of basal ganglia spiking neurons in the normal and Parkinsonian states. *Journal of Neural Engineering*, vol. 8, paper # 045002, 2011.
91. J. Liu, H.K. Khalil, and K.G. Oweiss. Neural feedback for instantaneous Spatiotemporal modulation of afferent pathways in bi-directional brain-machine interfaces. *IEEE Trans. Neural Syst. Rehabil. Eng.*, vol. 19, 521–533, 2011.
92. R. Li and H.K. Khalil. Nonlinear output regulation with adaptive conditional servocompensator. *Automatica*, vol. 48, 2550–2559, 2012.
93. R. Li and H.K. Khalil. On the steady-state error of a nonlinear regulator. *Int. J. Robust and Nonlinear Control*, vol. 23, 1869–1879, 2013.

94. K. Ma, H.K. Khalil, Y. Yao. Guidance law implementation with performance recovery using an extended high-gain observer. *Aerospace Science and Technology*, vol. 24, 177–186, 2013.
95. A.A. Prasov and H.K. Khalil. A nonlinear high-gain observer for systems with measurement noise in a feedback control framework. *IEEE Trans. Automat. Contr.*, vol. 58, 569–580, 2013.
96. A. Esbrook, X. Tan, and H.K. Khalil. Control of systems with hysteresis via servo-compensation and its application to nanopositioning. *IEEE Trans. Contr. Sys. Tech.*, vol. 21, 725–738, 2013.
97. A. Esbrook, X. Tan, and H.K. Khalil. An indirect adaptive servocompensator for signals of unknown frequencies with application to nanopositioning. *Automatica*, vol. 49, 2006–2016, 2013.
98. A.M.A. Boker and H.K. Khalil. Nonlinear observers comprising high-gain observers and Extended Kalman Filters. *Automatica*, vol. 49, 3583–3590, 2013.
99. H.K. Khalil and L. Praly. High-gain observers in nonlinear feedback control. *Int. J. Robust and Nonlinear Control*, vol. 24, 993–1015, 2014.
100. A. Esbrook, X. Tan, and H.K. Khalil. Inversion-free stabilization and regulation of systems with hysteresis via integral action. *Automatica*, vol. 50, 1017–1025, 2014.
101. A. Esbrook, X. Tan, and H.K. Khalil. Self-excited limit cycles in an integral-controlled system with backlash. *IEEE Trans. Automat. Contr.*, vol. 59, 1020–1025, 2014.
102. M. Edardar, X. Tan, and H.K. Khalil. Tracking error analysis for feedback systems with hysteresis inversion and fast linear dynamics. *J. of Dyn. Sys., Meas., and Contr.*, vol. 136, 2014.
103. M. Edardar, X. Tan, and H.K. Khalil. Design and analysis of sliding mode controller under approximate hysteresis compensation. *IEEE Trans. Contr. Sys. Tech.*, vol. 23, 598–608, 2015.
104. J. Lee, R. Mukherjee, and H.K. Khalil. Output feedback stabilization of inverted pendulum on a cart in the presence of uncertainties. *Automatica*, vol. 54, 146–157, 2015.
105. R. Jafari, F.B. Mathis, R. Mukherjee and H. Khalil. Enlarging the region of attraction of equilibria of underactuated systems using impulsive inputs. *IEEE Trans. Contr. Sys. Tech.*, vol. 24, 334–340, 2016.
106. A.A. Prasov and H.K. Khalil. Tracking performance of a high-gain-observer in the presence of measurement noise. *Int. J. Adaptive Control and Signal Processing*, vol. 30, 1228–1243, 2016.

107. J. Lee, R. Mukherjee, and H.K. Khalil. Output feedback performance recovery in the presence of uncertainties. *Systems & Control Letters*, vol. 90, 31–37, 2016.
108. J. Lei and H.K. Khalil. High-gain-predictor-based output feedback control for time-delay nonlinear systems. *Automatica*, vol. 71, 324–333, 2016.
109. J. Lei and H.K. Khalil. Feedback linearization for nonlinear systems with time-varying input and output delays by using high-gain predictor. *IEEE Trans. Automat. Contr.*, vol. 61, 2262–2268, 2016.
110. H.K. Khalil. Cascade high-gain observers in output feedback control. *Automatica*, vol. 80, 110–118, 2017.
111. H.K. Khalil. Extended high-gain observers as disturbance estimators. *SICE Journal of Control, Measurement, and System Integration*, vol. 10, 125–134, 2017.
112. H.K. Khalil. High-gain observers in feedback control: application to permanent magnet synchronous motors. *IEEE Control Systems Magazine*, vol. 37, 25–41, 2017.
113. D. Chowdhury and H.K. Khalil. Fast consensus in multi-agent systems with star topology using high gain observers. *IEEE Control Systems Letters*, vol. 1, 188–193, 2017.
114. A.M. Boker and H.K. Khalil. Semi-global output feedback stabilization of non-minimum phase nonlinear systems. *IEEE Trans. Automat. Contr.*, vol. 62, 4005–4010, 2017.

Chapters or Articles in Books

- H.K. Khalil. Linear-Quadratic-Gaussian estimation and control of singularly perturbed systems (invited paper). In: Ardema, M. D., editor, *Singular Perturbations in Systems and Control*, 191-214, New York, Springer-Verlag, 1983.
- H.K. Khalil. Singular perturbations and automatic control. In *Encyclopedia of Systems and Control*, 4435-4439, Pergamon Press, 1987.
- H.K. Khalil. State feedback control: two stage feedback design by slow-fast decomposition. In *Encyclopedia of Systems and Control*, 4529-4534, Pergamon Press, 1987.
- H.K. Khalil. Nonlinear systems. In: Masten, M.K. (editor) *Modern Control Systems (a study guide)*, IEEE, 1995.
- H.K. Khalil. Two-time-scale methods. In the *Control Handbook*, W.S. Levine, editor, 873–879, CRC Press and IEEE Press, 1996
- H.K. Khalil. Lyapunov stability. In the *Control Handbook*, W.S. Levine, editor, 889–895, CRC Press and IEEE Press, 1996

- H.K. Khalil. Nonlinear control: adaptation and learning. In Applications of Neural Adaptive Control Technology, J. Kalkkuhl et. al., editors, World Scientific Series in Robotics and Intelligent Systems, vol. 17, 1997.
- H.K. Khalil. High-gain observers in nonlinear feedback control. In New Directions in Nonlinear Observer Design, Lecture Notes in Control and Information Sciences, H. Nijmeijer and T.I. Fossen, editors, vol. 244, 249-268, 1999.
- P.V. Kokotovic. J.H. Chow, and H.K. Khalil, Singularly perturbed systems. In Wiley Encyclopedia of Electrical and Electronics Engineering, J.G. Webster, editor, vol. 19, 1999.
- H.K. Khalil and S.W. Shaw. Stability theory, nonlinear. In Wiley Encyclopedia of Electrical and Electronics Engineering, J.G. Webster, editor, vol. 20, 390-398, 1999.
- H.K. Khalil, Control of nonlinear systems, in Control Systems, Robotics, and Automation, edited by H. Unbehauen, in Encyclopedia of Life Support Systems (EOLSS), Developed under the Auspices of the UNESCO, Eolss Publishers, Oxford ,UK, [<http://www.eolss.net>], 2004.
- H.K. Khalil, Analysis of nonlinear control systems, in Control Systems, Robotics, and Automation, edited by H. Unbehauen, in Encyclopedia of Life Support Systems (EOLSS), Developed under the Auspices of the UNESCO, Eolss Publishers, Oxford ,UK, [<http://www.eolss.net>], 2004.
- H.K. Khalil, Lyapunov stability, in Control Systems, Robotics, and Automation, edited by H. Unbehauen, in Encyclopedia of Life Support Systems (EOLSS), Developed under the Auspices of the UNESCO, Eolss Publishers, Oxford ,UK, [<http://www.eolss.net>], 2004.
- H.K. Khalil. Two-time-scale and averaging methods. In the *Control Handbook*, Second Edition, W.S. Levine, editor, 39-1–39-13, CRC Press, 2011.
- H.K. Khalil. Lyapunov stability. In the *Control Handbook*, Second Edition, W.S. Levine, editor, 43-1–43-10, CRC Press, 2011.
- H.K. Khalil and E.G. Strangas. High-gain observers in robust feedback control of induction motors. In *AC Electric Motors Control: Advanced Design Techniques and Applications*, F. Giri. editor. Wiley, 2013.

Conference Papers

(The list does not include papers whose revised versions have appeared in refereed journals)

- H.K. Khalil, A.H. Haddad and G.L. Blankenship. Parameter scaling and well-posedness of stochastic singularly perturbed control systems, Asilomar Conference on Circuits, Systems and Computers, California, 407-411, 1978.

- H.K. Khalil. Disturbance isolation via high-gain feedback, Allerton Conference, University of Illinois, 779-786, 1979.
- A. Saberi and H.K. Khalil. Adaptive stabilization of SISO systems with unknown high-frequency gains, ACC, 1449-1454, 1986.
- F. Esfandiari and H.K. Khalil. Observer-based design of uncertain systems: recovering state feedback robustness under matching conditions, Allerton Conference, University of Illinois, 97-106, 1987.
- Y-C. Lin and H.K. Khalil. Two-time-scale design of active suspension control using acceleration feedback, IEEE Conference on Control Applications, Dayton, Ohio, 1992.
- H.K. Khalil. Robustness issues in output feedback control of feedback linearizable systems, the 1993 European Control Conference, Groningen, the Netherlands, 1993.
- H.K. Khalil. Nonlinear output feedback control, *Proceedings of Workshop on Advances in Control and its Applications*. Springer-Verlag, 108–132, 1996.
- H.K. Khalil. Nonlinear feedback control using high-gain observers. National Radio Science Conference, Cairo, Egypt. 1997.
- B. Aloliwi, E.G. Strangas, and H.K. Khalil. Robust speed control of induction motors. ACC, 1997.
- A.N. Atassi and H.K. Khalil. Input-output models for a class of nonlinear systems. CDC, 1997.
- B. Aloliwi and H.K. Khalil. Robust adaptive control of nonlinear systems with unmodeled dynamics, CDC, 1998.
- B. Aloliwi, H.K. Khalil, and E. Strangas. Robust speed control of induction motors using adaptive observers. ACC, 1999.
- S. Seshagiri and H.K. Khalil. Longitudinal adaptive control of a platoon of vehicles. ACC, 1999.
- H.K. Khalil. Comparison of different techniques for nonlinear output feedback adaptive control. CDC, 1999.
- B. Aloliwi, H.K. Khalil, and E.G. Strangas. Comparison of three torque controllers for induction motors without rotor position sensors. ICEM 2000, Helsinki, Finland, 2000.
- L.B. Freidovich and H.K. Khalil. Universal integral controllers for robotic manipulators. NOLCOS, Saint-Petersburg, Russia, 2001.
- H.S. Hyon and H.K. Khalil. Universal integral controllers with variable gains. ACC, 2003.

- L.B. Freidovich and H.K. Khalil. Comparison of logic-based switching control designs for a nonlinear system. ACC, 2004.
- S. Seshagiri and H.K. Khalil. Position Control of a PMSM Using Conditional Integrators. ACC, 2005.
- X. Tan and H.K. Khalil. Control of Unknown Dynamic Hysteretic Systems Using Slow Adaptation: Preliminary Results. ACC, 2007.
- J.J. Reynolds, X. Tan and H.K. Khalil. Closed Loop Analysis of Slow Adaptation in the Control of Unknown Dynamic Hysteretic Systems. CDC, 2007.
- H.K. Khalil. High-Gain Observers in Nonlinear Feedback Control. Int. Conf. on Control, Automation and Systems, Seoul, Korea, 2008.
- A. Memon and H.K. Khalil. Output Regulation of Linear Systems Subject to Input Constraints. CDC, 2008.
- X. Tan and H.K. Khalil. Two-Time-Scale Averaging of Systems Involving Operators and Its Application to Adaptive Control of Hysteretic Systems. ACC, 2009.
- M.S. Nazrulla and H.K. Khalil. Output Regulation of Non-Minimum Phase Nonlinear Systems Using an Extended High-Gain Observer. IEEE International Conference on Control and Automation, Christchurch, New Zealand, Dec. 2009.
- A. Memon and H.K. Khalil. Full-Order High-Gain Observers for Minimum Phase Nonlinear Systems. CDC 2009.
- M.S. Nazrulla and H.K. Khalil. Output regulation of non-minimum phase nonlinear systems using extended high-gain observers. IFAC World Congress, 2011.
- R.E. Bou Serhal and H.K. Khalil. Application of the extended high gain observer to underactuated mechanical systems. ACC 2012.
- F. Zhang, X. Tan and H.K. Khalil. Passivity-based controller design for stabilization of underwater gliders. ACC 2012.
- R. Li and H.K. Khalil. Conditional integrator for non-minimum phase nonlinear systems. CDC 2012.
- A.M.A. Boker and H.K. Khalil. Control of flexible joint manipulators using only motor position feedback: a separation principle approach. CDC 2013.
- J. Lei and H.K. Khalil. Robustness of high-gain-observer-based controllers to time delays. ACC 2016.
- A.A. Alfahaid, E.G. Strangas and H.K. Khalil. Speed control of permanent magnet synchronous motor using extended high-gain observer. ACC 2016.

- J. Lee, J. Choi and H.K. Khalil. New implementation of high-gain observers in the presence of measurement noise using stochastic approximation. ECC 2016.
- H.K. Khalil and S. Priess. Analysis of the use of low-pass filters with high-gain observers. IFAC Symposium on Nonlinear Control Systems, 2016.
- D. Chowdhury and H.K. Khalil. Funnel Control of Higher Relative Degree Systems. ACC 2017.
- D. Chowdhury, N. Kent, R. Mukherjee and H.K. Khalil. Enlarging the region of attraction of equilibria of underactuated systems using sum of squares and impulse manifold method. ACC 2017.
- J. Lei and H.K. Khalil. High-gain observers in the presence of sensor nonlinearities. ACC 2017.
- N. Kent, D. Chowdhury, R. Mukherjee and H.K. Khalil. An algorithm for enlarging the region of attraction using trajectory reversing. ACC 2017.
- N. Kant, R. Mukherjee, and H.K. Khalil. Swing-up of the Inertia Wheel Pendulum Using Impulsive Torques. CDC 2017.
- Y. Al-Nadawi, X. Tan, and H.K. Khalil. An Adaptive Conditional Servocompensator Design for Nanopositioning Control. CDC 2017.