

SOHEL ANWAR

Department of Mechanical Engineering, IUPUI

Professional Preparation

State of Michigan	Professional Engineer (ME)	P.E. License	2004
The University of Arizona	Mechanical Engineering	Ph.D.	1994
Florida State University	Mechanical Engineering	M.S.	1990
Bangladesh Univ. Eng. & Tech.	Mechanical Engineering	M.Sc. Eng.	1988
Bangladesh Univ. Eng. & Tech.	Mechanical Engineering	B.S.	1986

Appointments

07/09-Present	Associate Professor, Dept. of Mechanical Engineering, Purdue School of Engineering & Tech., IUPUI, Indianapolis, IN.
06/09-08/09	Faculty Summer Intern, Raytheon Technical Services Company, Indianapolis, IN
09/04-06/09	Assistant Professor of Mechanical Engineering, IUPUI, Indianapolis, IN.
08/03-08/04	Adjunct Faculty, Dept. of Mechanical Engineering, University of Michigan - Dearborn, Dearborn, MI.
1999-2004	Staff Control Systems Engineer, Chassis Advanced Technology Department, Ford Motor Company / Visteon Corporation, Dearborn, MI.
1995-1999	Staff Consulting Engineer, Technical Services Div., Caterpillar, Inc., Peoria, IL.
1994-1995	Research Associate, Dept. of Systems and Industrial Engineering, University of Arizona, Tucson, AZ
1986-1988	Lecturer, Dept. of Mechanical Eng., Bangladesh Univ. of Eng. & Tech., Dhaka.

PROFESSIONAL AFFILIATIONS

08/04 – Present	Faculty Advisor, Society of Automotive Engineers (SAE) – IUPUI Chapter
05/95 – Present	Member, American Society of Mechanical Engineers (ASME)
05/95 – 08/03	Member, Society of Automotive Engineers (SAE) International
08/00 – 08/03	Member, Institute of Electrical and Electronic Engineers (IEEE)

Awards and Honors

1. “Student Supervisor of the Year” Nomination, IUPUI Career & Employment Services, 2008.
2. Research Initiative Award, Purdue School of Engineering & Tech., IUPUI, 2005.
3. “Leading the Way” Award Nomination, Visteon Corp., 2003.
4. Rewards and Recognition Award, Visteon Corp., 2001-2003.
5. Graduate Fellowship Award, University of Arizona, 1991-1992.
6. Chancellor’s Award, Government of Bangladesh, 1987.

Service to Professional Societies

03/07 – Present	Associate Editor, <i>IEEE Transactions on Vehicular Technology</i>
06/2005	Session Co-Chair, <i>American Control Conference</i> , Portland, Oregon
05/2006	Facilitator, SAE Central Indiana Section meeting at IUPUI

School Committees:

2004 – Present	SAE Faculty Advisor, IUPUI Chapter
2005 – Present	Member, Faculty Senate
2005 – Present	FE Exam Review Coordinator, Purdue School of Eng. & Tech., IUPUI

University Committees

1/1/07 – Present	Member, Academic Advisory Council, Engineering and Professional Education Division, Purdue University, West Lafayette, IN.
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Selected Publications

In Journals

1. **S. Anwar**, "Fault Detection, Isolation, and Control of Drive By Wire Systems", A Chapter in Book "Fault Detection", Editor: V. Kordic, Intech Publishing, Vienna, Austria (in press).
2. B. Zheng and **S. Anwar**, "Yaw stability control of a steer-by-wire equipped vehicle via active front wheel steering", *Mechatronics*, vol. 19, no. 6, September, 2009, pp. 799-804
3. **S. Anwar**, "Drive by Wire Systems: Impact on Vehicle Safety and Performance", *Book Chapter in Automotive Informatics and Communicative Systems: Principals in Vehicular Networks and Data Exchange*, Editor: H. Guo, IGI Global, Hershey, PA, April, 2009.
4. B. Zheng and **S. Anwar**, "Fault Tolerant Control of the Road Wheel Subsystem in a Steer-By-Wire System", *International Journal of Vehicular Technology*, Vol. 2008, Article ID 859571, doi:10.1155/2008/859571, 2008, pp. 1-8.
5. **S. Anwar** and L. Chen, "An Analytical Redundancy Based Fault Detection and Isolation Algorithm for a Road-Wheel Control Subsystem in a Steer-By-Wire System", *IEEE Transactions on Vehicular Technology*, Vol. 56, No. 5, September, 2007, pp. 2859-2869.
6. **S. Anwar** and B. Zheng, "An Anti-Lock Braking Algorithm for an Eddy current based Brake-By-Wire System", *IEEE Transactions on Vehicular Technology*, v 56, n 3, 2007, pp. 1100-1107.
7. **S. Anwar**, "Anti-Lock Braking Control of a Hybrid Brake-By-Wire System", *Journal of Automobile Engineering – IMechE Proceedings Part D*, v 220, n 8, 2006, pp. 1101-1117.
8. **S. Anwar**, "Generalized Predictive Control of Yaw Dynamics of a Hybrid Brake-By-Wire Equipped Vehicle", *Mechatronics*, v 15, November, 2005, pp 1089-1108.
9. **S. Anwar**, "A Parametric Model of an Eddy Current Electric Machine for Automotive Braking Applications", *IEEE Transactions on Control Systems Technology*, Vol. 12, Issue 3, 2004, pp. 422-427.
10. S. Cetinkunt, U. Pinoson, C. Chen, A. Egelja, and **S. Anwar**, "Positive Flow Control of Closed Center Electrohydraulic Implement-By-Wire Systems for Mobile Equipment Application", *Mechatronics*, Vol. 14, 2004, pp.403-420.
11. **S. Anwar**, "Brake Based Vehicle Traction Control Via Generalized Predictive Algorithm", *SAE Transactions Journal of Passenger Cars: Mechanical Systems*, v 112, n 6, 2003, pp. 296-303.
12. **S. Anwar**, "A Predictive Control Algorithm for Vehicle Yaw Stability Management", *SAE Transactions Journal of Passenger Cars: Mechanical Systems*, v 112, n 6, 2003, pp. 1325-1334.
13. **S. Anwar** and B. Ashrafi, "A Predictive Control Algorithm for an Anti-Lock Braking System", *SAE Transactions Journal of Passenger Cars: Mechanical Systems*, v 111, n 6, 2002, pp. 484-490.
14. **S. Anwar**, "Sliding Mode Control of Large Wheel Loader Powertrain for Full Throttle Directional Shifts", *SAE Transactions Journal of Commercial Vehicles*, v 107, n 2, 1998.
15. **S. Anwar**, "Mechanical Behavior of Jute-Glass Fiber Reinforced Composite Laminates", *Journal of Mechanical Engineering Research & Developments*, Vol. 17, December, 1994, pp. 13-29.

In Conference Proceedings

16. Harpreetsingh Banvait, **Sohel Anwar**, and Yaobin Chen, "A Rule-Based Energy Management Strategy for Plug-in Hybrid Electric Vehicle (PHEV)", *American Control Conference*, St. Louis, MO, June 10 – 12, 2009.
17. Harpreetsingh Banvait, Xiao Lin, **Sohel Anwar**, and Yaobin Chen, "Plug-in Hybrid Electric Vehicle Energy Management System using Particle Swarm Optimization", *Electric Vehicle Symposium (EVS – 24)*, Stavanger, Norway, May 13 – 16, 2009.

18. D. Reyhart and **S. Anwar**, "Optimal Control of an On Demand All Wheel Drive System", *ASME International Mechanical Engineering Congress and Exposition*, Boston, MA, October 31 – November 6, 2008.
19. M.S. Hasan and **S. Anwar**, "Sliding Mode Observer Based Predictive Fault Diagnosis of a Steer-By-Wire System", *Proceedings of the 17th International Federation on Automatic Control (IFAC) World Congress*, Seoul, Korea, July 6-11, 2008.
20. D. Reyhart and **S. Anwar**, "A Fuzzy Distributed Control Algorithm for Intelligent Ground Speed Control of an Automotive Vehicle", SAE paper Number 2008-01-0902, *SAE World Congress and Exposition*, Detroit, MI, April 14-17, 2008.
21. M.S. Hasan and **S. Anwar**, "Sliding Mode Observer and Long Range Prediction Based Fault Tolerant Control of a Steer-By-Wire Equipped Vehicle", SAE paper Number 2008-01-0903, *SAE World Congress and Exposition*, Detroit, MI, April 14-17, 2008.
22. Y. Lin and **S. Anwar**, "Design of an On-Demand All Wheel Drive Control System for Improved Autonomous Navigation", *Proceedings of the 6th Triennial IFAC Symposium on Intelligent Autonomous Vehicles*, Toulouse, France, September 3-5, 2007.
23. S. Anwar, "Predictive Yaw Stability Control of a Brake-By-Wire Equipped Vehicle via Eddy Current Braking", *American Control Conference*, New York, NY, July 11 – 13, 2007.
24. Y. Lin and **S. Anwar**, "A Traction Enhanced On-Demand All Wheel Drive Control System for a Hybrid Electric Vehicle", SAE Paper No. 2007-01-0299, *SAE World Congress and Exposition*, Detroit, MI, 2007.
25. B.C. Snyder and **S. Anwar**, "A Multi-threaded Computing Algorithm for Pure Simulation of Complex Systems in SIMULINK", SAE Paper No. 2007-01-1632, *SAE World Congress and Exposition*, Detroit, MI, 2007.
26. M.S. Hasan and **S. Anwar**, "Yaw Stability Control System for An Automobile Via Steer-by-Wire", *Proceedings of the 4th International Conference on Electrical & Computer Engineering*, Dhaka, Bangladesh, December 19-21, 2006.
27. **S. Anwar** and R.C. Stevenson, "Torque Characteristics Analysis of an Eddy Current Electric Machine for Automotive Braking Applications", *Proceedings of the American Control Conference*, Minneapolis, Minnesota, June 14-16, 2006.
28. B. Zheng, M. Huang, B. Daugherty, and **S. Anwar**, "Integrated Steer-By-Wire control and diagnostic system", *Proceedings of the American Control Conference*, Minneapolis, Minnesota, June 14-16, 2006.
29. **S. Anwar** and L. Chen, "Analytical Redundancy Based Robust Fault Tolerant Control of a Steer-By-Wire System", *Proceedings of the ASME Int'l Mechanical Engineering Congress and Expo.*, Chicago, IL, November 5-10, 2006.
30. **S. Anwar**, "A Torque based Sliding Mode Control of an Eddy Current Braking System for Automotive Applications", *Proceedings of 2005 ASME International Mechanical Engineering Congress and Exposition*, November 5-11, 2005, Orlando, Florida, USA, IMECE2005-79148.
31. **S. Anwar**, "Anti-Lock Braking Control of an Electromagnetic Brake-By-Wire System", *Proceedings of 2005 ASME International Mechanical Engineering Congress and Exposition*, November 5-11, 2005, Orlando, Florida, USA, IMECE2005-79149.
32. S. Anwar, "Yaw Stability Control of an Automotive Vehicle via Generalized Predictive Algorithm", *Proceedings of the American Control Conference*, Portland, Oregon, June 8-10, 2005.

33. **S. Anwar**, "Modeling and Analysis of Steady-State Torque Characteristics for a Miniature Electromagnetic Retarder", *Proceedings of the American Control Conference*, Portland, Oregon, June 8-10, 2005.
34. B. Zheng, C. Altemare, and **S. Anwar**, "Fault Tolerant Steer-By-Wire Road Wheel Control System", *Proceedings of the American Control Conference*, Portland, Oregon, June 8-10, 2005.
35. **S. Anwar**, "An Anti-Lock Braking Control System for a Hybrid Electromagnetic/Electrohydraulic Brake-By-Wire System", *Proceedings of the American Control Conference*, Boston, MA, June 30-July 2, 2004.
36. S. Cetinkunt, U. Pinsopon, C. Chen, A. Egelja, and **S. Anwar**, "Implement-by-Wire Control of Electrohydraulic Closed Center Systems for Mobile Equipment Applications", *Proceedings of the IASTED International Conference on Robotics and Applications*, Salzburg, Austria, June 25-27, 2003, p 24-28.
37. **S. Anwar**, "Unidirectional Active Noise Attenuation through Generalized Predictive Algorithm", SAE Paper No. 2001-01-2224, *31st International Conference on Environmental Systems*, Orlando, Florida, July 9-12, 2001.
38. **S. Anwar**, and A. Chandra, "Generalized Predictive Kinetic Energy Controller for Vibration Suppression in Turning", Paper No. 1999-01-1873, *Proceedings of the SAE Annual Earthmoving Conference & Exposition*, Peoria, IL, April 14-15, 1999.
39. D. DeMott and **S. Anwar**, "A Hybrid Approach to Ground Speed Control of Large Wheel Loaders with Engine at Full Throttle", SAE Paper No. 971562, *Proceedings of the SAE Annual Earthmoving Industry Conference and Exposition*, Peoria, IL, April, 1997.
40. **S. Anwar**, A. Chandra, and K. B. Ousterhout, "Predictive Control of Chatter Instabilities in Single Point Turning", The Intelligent Machine Tools Systems Symposium, *Proceedings of the ASME International Mechanical Engineering Congress and Exposition*, Chicago, Nov. 6-11, PED vol. 68-2, pp. 767-782, 1994.
41. **S. Anwar** and P.J. Hollis, "An Adaptive Control System for Active Attenuation of Wind Tunnel Noise", *Proceedings of the Conference on Recent Advances in Active Control of Sound & Vibration*, VPI & SU, Blacksburg, Virginia, April 15-17, pp. 118-132, 1991.

Patents

42. **S. Anwar**, "Vehicle yaw stability system and method", *United States Patent Number 7,137,673*, Assignee: Visteon Corp., November 21, 2006.
43. N. Duan, L. Macklem, M. Rahaim, **S. Anwar**, G. Monkaba, W.P. Perkins, D. Wisniewski, T. Kendall, and J. Palazzolo, "Hydraulic coupling system", *United States Patent Number 7,059,460*, Assignee: Visteon Corp., June 13, 2006.
44. **S. Anwar**, C. Klaes, and K. Pavlov, "Method and Apparatus for Power Management of a Regenerative Braking System", *United States Patent Number 7,029,077*, Assignee: Visteon Corp., April 18, 2006.
45. **S. Anwar**, D. Wisniewski, N. Szalony, N. Duan, H. Tan, S. Shen, C. McKenzie, and H. Lee, "Control of a Hydraulic Coupling System", *US Patent Number 7,007,782*, Assignee: Visteon Corp., March 7, 2006.
46. **S. Anwar**, "Control Algorithm for a Yaw Stability Management System", *US Patent Number 6,885,931*, Assignee: Visteon Corp., April 26, 2005.

47. **S. Anwar**, C. Klaes, and K. Pavlov, "Method and Apparatus for Power Management of a Braking System", *US Patent Number 6,871,919*, Assignee: Visteon Corp., March 29, 2005.
48. **S. Anwar**, "A Predictive Control Algorithm for an Anti-Lock Braking System", *US Patent Number 6,728,620*, Assignee: Visteon Corp., April 28, 2004.
49. **S. Anwar** and K. Pavlov, "A Control Algorithm for a Hybrid Electromagnetic/Friction Brake System for Automobiles", *US Patent Number 6,702,404*, Assignee: Visteon Corp., March 9, 2004.
50. **S. Anwar**, "A Closed Loop Control Algorithm for an Eddy Current Brake System", *US Patent Number 6,619,760*, Assignee: Visteon Corp., September, 2003.
51. C. Chen, **S. Anwar**, R. Ingram, K. Bates, and S. Cetinkunt, "Method and System for Controlling Steady-State Speed of Hydraulic Cylinders in an Electrohydraulic System", *US Patent Number 6,459,976*, Assignee: Caterpillar, Inc., Oct. 1, 2002. Also DE 10122671.
52. **S. Anwar**, S. Cetinkunt, C. Chen, R. Ingram, and U. Pinsopon, "Methods for Performing Automated Work Machine Functions", *US Patent Number 6,371,214*, Assignee: Caterpillar, Inc., April 16, 2002. Also DE 10028606.
53. **S. Anwar**, "Full Throttle Directional Shift", *US Patent Number 6,019,202*, Assignee: Caterpillar, Inc., February 1, 2000.

Major Funded Research

- *Plug-in Hybrid Electric Vehicle (PHEV) Development*, Indiana Office of Energy and Defense Development, \$ 132,392, 08/2007 – 05/2008, Principal Investigator.
- *Electronic Fuel Control (EFC) Dynamic Performance Test Method*, Cummins, Inc., Columbus, IN, \$ 49,357, 1/08 – 12/08, Principal Investigator.
- *Advanced Control Algorithms for Improved Navigation of Autonomous Machines*, Servo Tech, Inc., Chicago, IL, \$ 40,001, 1/08 – 12/08, Principal Investigator.
- *Sensing and Computer Algorithms for Autonomous Machines – Phase I and II*, Servo Tech Inc., Chicago, IL, \$84,633, 05/2006 – 10/2008, Principal Investigator.
- *Simulator Driving Data Collection on Headrest Driver Monitor*, Delphi Corporation, \$ 24,146, 06/2007 – 11/2007, Principal Investigator.
- *Multi-Rate Modeling and Simulation of Engine Systems*, Cummins, Inc., \$53,359, 5/2005 – 05/2006, Principal Investigator.
- *Analytical Redundancy Based Fault Tolerant Control of Drive-By-Wire Systems*, Research Support Funds Grant, IUPUI, \$ 27,750, 06/2006 – 05/2007, PI.
- *Precision Cartesian Robot System*, NSK Precision America, Indianapolis, IN, Equipment Grant, \$ 34,362 (original cost), 1/07 – 12/07, Principal Investigator.
- *Traction Enhanced On Demand All Wheel Drive System for Hybrid Vehicles*, Visteon Corporation, Van Buren Twp, MI, Equipment Grant, \$20,000 (original cost), 1/06–12/06, Principal Investigator.

Graduate Students (Thesis Option – Major Professor)

Students Graduated:

1. Yifeng Lin, MSE, Thesis: "*Optimal Design of an On-Demand All-Wheel-Drive Control System for Vehicle Traction Enhancement*", December, 2006.

2. Benjamin C. Snyder, MSME, Thesis: “*A Multi-Threaded Computing Algorithm for Pure Simulation of Complex System in SIMULINK*”, December, 2006.
3. Mohammad S. Hasan, MSME, Thesis: “*Analytical Redundancy Based Fault Tolerant Control of Steer-By-Wire Systems for Improved Efficiency*”, December, 2007.
4. Delon Reyhart, MSME, Thesis: “*Optimal Control of Acceleration Wheel Slip of a Vehicle via Torque Proportioning to the Wheels*”, Expected December, 2008.
5. Wei Niu, MSME, Thesis: “*Nonlinear Observer and Prediction Based Fault Detection and Isolation on a Steer By Wire Hardwire-In-Loop Bench*”, Expected December, 2008.

Current Students:

6. Harpreetsingh Banvait, MSEE, Thesis: “*Optimal Energy Management of a Plug-in Hybrid Electric Vehicle (PHEV) via Particle Swarm Optimization*”, In-Progress.
7. Umut Tugsal, MSEE, Thesis: “*System Identification and Failure Mode Detection of an Electronic Fuel Control Valve for Diesel Engines*”, In-Progress.
8. Emrah T. Yildiz, MSME, Thesis: “*Optimal Energy Management Algorithm for a Plug-in Hybrid Electric Vehicle (PHEV)*”, In-Progress.
9. Quazi Farooqi, MSME, Thesis: *TBD*, New student.

Graduate Students (Graduate Project / Non-Thesis Option – Major Professor)

10. Lei Chen, MSEE, Advanced Electrical Engineering Project: “*Steer-By-Wire: System Robustness via Analytical Redundancy and Fault Tolerant Algorithm*”, December, 2005.
11. James Worthing, Matthew Squire, and Peter Morgan, MSME, PUWL EPE Mechanical Engineering Projects, “*Volumetric Efficiency and Air Per Cylinder Estimation of an Internal Combustion Engine Utilizing Engine Torque Estimation Models*”, December, 2007.
12. Daniel Aw, Non-Degree, Research Project: “*Driving Simulator Data Collection on Headrest Driver Monitor*”, September, 2008.

Undergraduate Students (Major Advisor)

13. Nicholas Berkeley (ECE), Engineering Design Project: “*On-Demand All Wheel Drive System Setup Project*”, May, 2006.
14. Krishna S. Patel (ME), McNair Scholar, 2007 Summer Project: “*Impact of Drive-By-Wire Systems on Motorsports Industry*”, 05/07 – 08/07.
15. John Snodgrass (ME) and Gaston Tamboura (ECE), MURI Project: “*Experimental Verification of an Optimal On-Demand All-Wheel-Drive Control System*”, 09/06 – 05/07.
16. Monis Rahman (ECE) and Caleb Audu (ME), MURI Project: “*Analytical Redundancy Based Fault Tolerant Control of Steer-By-Wire Systems*”, 09/07 – 06/08.
17. Pratik N. Sheth (ME) and Priyam Agarwal (CS), MURI Project: “*Feasibility study of a Noninvasive Optical Sensor for Measuring Blood Alcohol Concentration to Detect Drunk Driver*”, 01/08 – 06/08.
18. Michael Li (ME), MURI Project: “*Development of a Joint Loader*”, 01/08 – 08/08.