

## **DR. CELAL BATUR**

**6/30/2019**

### **Expertise:**

**Process identification and control applied to diagnostics, health monitoring, crystal growth control , motion control and polymeric systems.**

### **DEGREES IN FIELD**

Ph.D. In Process Modeling and Control, University of Leicester, England, 1976.

B. Sc. and M.Sc. in Mechanical Engineerig. Technical University of Istanbul, Turkey  
1970, 1971.

### **EXPERIENCE**

- 2011- Director of NSF, Industry University Cooperative Research Center.
- 1999-2013 Prof. and Chair of Mechanical Engineering
- 1994- Prof. of Mechanical Eng. Univ. of Akron, Akron-Ohio.
- 1984-1994 Assoc. Prof. of Mechanical Eng. Univ. of Akron, Akron-Ohio.
- 1982-1984 Chief Engineer and Partner, Vacuum Plast, Istanbul, Turkey.
- 1980-1982 Visiting Prof. of Mechanical Eng. Univ. of Akron, Akron-Ohio.
- 1976-1980 Assist. Prof. of Mechanical Eng. Technical Univ. of Istanbul, Turkey.

### **EXPERIENCE IN TEACHING**

#### **A. GRADUATE COURSES INTRODUCED AND TAUGHT**

- 1. 4600-645 Process Identification and Computer Control
- 2. 4600-646 Expert Systems in Controls and Manufacturing
- 3. 4600-544 Robotics, Design, Controls and Application
- 4. 4600-642 System Analysis and Controller Design
- 5. 4600-697 Neural and Fuzzy Control Systems
- 6. 4600-541 Control System Design

#### **B. UNDERGRADUATE COURSES TAUGHT**

- 1. 4600-203 Dynamics
- 2. 4600-440 System Dynamics and Control
- 3. 4600-444 Robotics, Design, Controls and Application
- 4. 4600-305 Thermal Science
- 5. 4600-483 Measurement Laboratories
- 6. 4600-401 Design of Energy Systems
- 7. 4600-461 Design of Mechanical Systems
- 8. 4600-380 Engineering Analysis
- 9. 4600-340 System Dynamic and Response
- 10. 4600-441 Control System Design

11. 4600-105 Tools of Mechanical Engineering
12. 4600-460 Concepts of Design (team taught)
13. 4600- Industrial Automatic Control 542

**C. PH.D DISSERTATIONS DIRECTED (ADVISOR)**

1. Neural Networks for Controls  
Vicken S. Kasparian, December 1992
2. Crystal Growth Control  
Arvind Srinivasan, Fall 1994
3. Polymer Processing Control  
Tawfik Maged, 1997
4. Crystallinity Control in Extrusion  
Leephakpreeda Thananchai, Spring 1996
5. Javeed Nizami  
Polymer Processing Control, December, 1997
6. Mahmut Karaman  
Melt Spinning Control, December, 1997
7. Hui Zhong  
December, 2004
8. Santanu Chandra,  
Microgripping, December 2007
9. Juntao Fei  
Sliding Mode Controller, 2007
10. John A Mackey  
Thermoelectric Energy Conversion: Advanced Thermoelectric Analysis and  
Materials Development, 2015

**D. THESIS DIRECTED, (ADVISOR AND CO-ADVISOR)**

1. Design of a Totally Implantable Artificial Bladder and Sphincter  
Kathleen M. Kellackey, Spring 1988
2. Left Ventricle Assist Device  
B.F. Hete, Spring 1987 (Co-advisor)
3. Crystal Growth Control  
R. Sharpless, Spring 1991
4. Fault Diagnosis  
A. Srinivassan, Spring 1991
5. Impact Propagation  
Dan Deckler, Spring 1990
6. Gripper Control  
Mark Hodowanec, Fall 1991 (Co-advisor)
7. Stereo Vision  
Shailesh Kozarekar, Summer 1990
8. Microprocessor Control  
Gopichandra Surnilla, Spring 1992

9. Neural Networks  
Haiyan Zhang, December 1991
10. Robust Controller Design for the Crystal Growth Furnace  
Chang-Rae Lee, Summer 1992
11. Optimization by Neural Networks  
Karaman Mahmut, Summer 1993.
12. Fuzzy Control  
M. Crapo, Spring 1992.
13. Stereo Particle Tracing  
V. Purushhothaman, Summer 1993.
14. Process Control  
Mike Michaud
15. Artificial Intelligence for Controls  
Joseph Saus
16. Computerized Force Control of a Pneumatic Robot Gripper  
G. Namala, Jan. 1993
17. Computer Interface for High-Torque Stepping with an AC Synchronous Motor  
M. Jayaram, Jan. 1993
18. Life and Reliability Analysis of Aircraft Transmission  
M.G. Prasanna, Jan. 1993
19. Computerized Cold Forming in Scale  
P. Shah, Jan. 1992
20. Computer Controlled Cold Forming for Circular Plate  
S. Krishnaswami, Jan. 1991
21. Controlled Indexing Dynamics Using Computer Pulsed Stepping Motors  
R.J. Knorr, Jan. 1984
22. Self-tuning rubber cut control  
Michael E. Wroe 1992
23. Projective Control  
A. Srinivassan, Fall 1993
24. Stability of Fuzzy Logic Controller  
Leephakpreeda Thananchai, Fall 1993
25. Set-membership Identification  
Khen Cheng, Fall 1996
26. Internet Based Control  
Qui Ma, Fall 1998
27. Hydraulic Motion Control  
Mani Grindra, Fall 1998
28. Observer Based Sliding Mode Control of an Electrohydraulic servovalve  
Linghui Zhang, May 2001
29. Identification and Discrete Time Sliding Mode Control of a Pneumatic System  
Wei Ye, May 2001
30. Support Vector Machines  
Ling Zhou, 2001
31. Mems Gyro,  
K. Qais, Spring 2002

32. An Internet Based Tuning and Monitoring of a Position Control System,  
Laxmi Vulpala, 2000
33. Sliding Mode Control of Actuators  
Syed Jalal, 2003
34. High Temperature Piezo Electric Materials  
Zoltan Gubinyi, 2006
35. Fatigue in Piezo Materials  
Jess Robbins, Spring 2009
36. Electrospinning Control  
Charlie Druessedow, August 2008.
37. Wind Turbine Controls  
Vladimir Dzodzo, 2012
38. Attitude Control  
Ishrow Gautam, 2018
39. Alexander Sorin  
Model Predictive Control, 2019

**E. SPECIAL PROJECTS DIRECTED**

1. Fuzzy Control  
V. Kasparian, Spring 1989
2. Self-tuning Control  
T. Soldat, Spring 1989
3. Multivariable Self-tuning Control  
C. Christodolu, Spring 1990
4. Flexible Robotic Workcell  
V. Peng, Spring 1990
5. Robotic Vision System for Flexible Manufacturing  
C. Phillipou, Spring 1988
6. Optical Encoders for Position and Rate Feedback in Robotics  
V. Kottamasu, Spring 1987
7. Self-tuning Regulators  
Julio Valejo, Spring 1986
8. Neural Networks  
Hussam Samour, Spring 1990
9. Expert Systems  
Mark Gibbs, Spring 1991
10. Fuzzy Control  
Robert Beer, Summer 1998.
11. M. Musher  
Hydraulic Control, December, 2004
12. Daniel Shy  
Tire-road Friction, 2019

## SCHOLARLY PUBLICATIONS

### A. BOOK CHAPTERS

1. C. Batur, V. Kasparian, "Fuzzy Knowledge Based Controller Design", in Intelligent Systems in Design and Manufacturing. 1994. Published by ASME Press.
2. C. Batur, Chan C-C, Srinivasan, A. "Inverse Fuzzy Model Based Controllers", Methods and Applications of Intelligent Control, pp. 173-197. Kluwer Academic Publisher, 1997.

### B. REFEREED JOURNAL PUBLICATION

1. Batur, C., "Prediction in control systems", Journal of ITU., Vol. 37, No. 5. 1979.
2. Batur, C., "System Identification and Adaptive Control Based on Box and Jenkins Control Scheme", Bull. of Tech. Univ., Vol. 32, pp. 65-71, 1979.
3. Batur, C., "Optimum and sub-optimum stochastic control", Journal of ITU., Vol. 37, No. 4, pp. 46-50, 1979.
4. Batur, C., "Identification of electric process heater by microprocessor", Bull. Tech. Univ., Vol. 35, pp. 63-70, 1982.
5. Batur, Celal, "A Modified Algorithm for the Least Squares Identification", Trans. of ASME Journal of Dynamic Svstems Measurement and Controls, pp. 50-52, March 1983.
6. Batur, Celal., "Self Tuning Controller for the Smith Control Scheme", Instrumentation Systems and Automation, Vol. 40, Part 1, pp. 637-642, Oct. 1985.
7. Braun, M.J., Ida, N., Batur, C., Rose, B., Hendricks, R C., Mullen, R.L., "A Non-invasive Laser Based Method in Flow Visualization and Evaluation in Bearings", Paper No: C-288/87, IMechanical Engineering, London-England, pp. 37- 46, 1987.
8. Mussivand, T., Navarro, R., Chen, J., Braun, M.J., Harasaki, H., Kiraly, R., Batur, C., McMillin, C.R., Nose, Y., "Flow Visualization in Artificial Hearts Using Diffuse and Planar Laser Lighting", Trans. of Amer. Soc. of Artificial Internal Organs, Vol 34, July-September 1988, No 3, pp. 317 - 321.
9. Batur, C., Braun, J.M., Shaffer, T., Rose, B., "Computer Based Flow Visualization as an Instructional Tool for Fluid Dynamics", Coed. Journal of Computers in Education. Vol. VII, No. 4, October 1988, pp. 14-20.
10. Padovan, J., Choy, F K., Batur, C., Canilag, L., "Seismic Induced Impeller Blade Rubs in Rotating Power Plant Components, ", Journal of Pressure Vessel Technology, Vol. 110, No. 4, pp. 405-413, 1988.

11. Choy, F K., Padovan, J., Batur, C., "Rub Interactions of Flexible Casing Rotor Systems with Base Excitations", ASME Journal of Engineering for Gas Turbines and Power, Vol. 111, No 4, pp: 652-659, October 1989.
12. Batur, C., Braun, M.J., "Measuring Flow With Machine Vision", Intech., Intern. Journal of ISA, Vol. 36, No. 2, 1989.
13. Hete, B.F., Savage, M., Batur, C., "A High Pressure Portable Pneumatic Drive Unit", Journal of Artificial Organs, Vol. 13, No. 6, 1990, pp. 539-545.
14. Braun, M.J., Batur, C., "Non-Intrusive Laser Based Full Field Quantitative Flow Measurements Aided by Digital Image Processing, Part 2: The Case of Hydrostatic Bearing," , Journal of Tribology International, pp. 277-289, Vol. 13, 1991.
15. Batur, C., Kasparian, V., "Predictive fuzzy expert controllers", International Journal of Computers and Industrial Engineering. Vol. 20, No. 2, pp. 199-209, 1991.
16. Batur, C., Srinivasan, A., Chan, C.C., "Automated Rule Based Model Generation for Uncertain Complex Dynamic Systems", Journal of Engineering Applications of Artificial Intelligence, Vol. 4 , No.4, May 1991.
17. Batur, C., "Process modeling by neural nets", Journal of Modelling and Scientific Computing, submitted..
18. Batur C., Kasparian, V., "Adaptive Expert Control", International Journal of Control, Vol. 54, Number 4, pp. 867-881, 1991.
19. Batur, C., Kasparian V., "Model based fuzzy control", Journal of Mathematical and Computer Modeling, Pergamon Press, Vol. 15, No. 2. pp. 3-15, 1992.
20. Batur, C., Sharpless, R. B., Duval, W.M.B , Rosenthal, B.N., "Self-tuning multivariable Pole Placement Control of Multizone Crystal Growth Furnace", Journal of Adaptive Control and Signal Processing, Vol. 6, pp. 111-123, 1992.
21. Batur, C., Sharpless, R B, Duval, W.M.B, Rosenthal, B.N., Singh, N B, "Identification and Control of a Multizone Crystal Growth Furnace", Journal of Crystal Growth, 119, pp. 371-380, 1992.
22. Batur C., Kasparian, V., "Fuzzy Adaptive Control", International Journal of Systems Science, Vol. 24, No.2, 301-314, 1993.
23. Srinivasan, A., Batur, C., "Fault Detection and Isolation in Unsupervised Learning Environment", Journal of Pattern Recognition Letters, 15, 235-242, March 1994.

24. Srinivasan, Arvind., Batur Celal., "Hopfield/Art-1 Neural Networks Based Fault Detection and Isolation", IEEE Transactions on Neural Network, Volume 5, Number 6, November 1994, pp: 890-900.
25. Srinivasan, A., Batur, C., Chan, C.C., "Using Inductive Learning to Determine Fuzzy Rules for Dynamic Systems", Journal of Engineering Applications of Artificial Intelligence, Vol. 6., No. 3 pp. 257-264, 1993.
26. Batur, C., Kasparian V.S., " A Self-tuning Fuzzy Controller with Switching Control Modes", Journal of Dynamic Systems Measurement and Controls, December 1994, Vol 116/1 , pp: 795-801.
27. Janson , R. W., Batur , C., Krishna L., "The Effects on Energy Markets Subjected to Regulatory Changes Using Neural Network Methodology", The Ohio Journal of Science, Volume 94, Number 3, June 1994 pp: 60-70.
28. Srinivasan A., Batur, C., Veillette R., "Projective Control Design for Multi-zone Crystal Growth Furnace", IEEE Transactions on Control System Technology, Vol. 2. No. 2, June 1994.
29. Kasparian V.S., Batur, C., Zhang, H., Padovan J., " Davidon Least Squares Based Learning Algorithm for Feedforward Neural Networks", International Journal of Neural Network, Vol. 7, No. 4, pp. 661-670, 1994.
30. Kasparian V.S., Batur, C., Duval, W.M.B, Rosenthal, B.N., Singh, N B "Application of Stereo Imaging for Recognition of Crystal Surface Shapes", Journal of Crystal Growth, Vol., 141 455-464, 1994.
31. Kasparian V.S., Batur, C., " Neural Network Based Adaptive Controller", IEEE Transactions on Neural Networks., submitted.
32. Batur, C., Srinivasan, A., Chan, C.C., " Fuzzy Model Based Fuzzy Predictive Controllers", Journal of Intelligent & Fuzzy Systems, Volume 3 No. 2, 1995.
33. Batur, C., Srinivasan, A., Duval, W. M. B, Rosenthal, B. N., Singh, N. B., "Crystal Growth Control in Bridgman Furnace", Journal of Progress in Crystal Growth and Characterization, Vol. 30, pp. 217-236, 1995.
34. Batur, C., Leephakpreeda, T, "Control of Crystallinity in Polymer Extrusion Processes", Journal of Inverse Problems in Engineering Vol. 4, pp. 153-176, 1996.
35. Batur, C., Leephakpreeda, T, " Dynamic Control of Crystallinity During Sheet Extrusion", ASME Journal of Dynamic Svstems Measurement and Controls, submitted.
36. Srinivasan, A, Batur, C., Duval, W. M. B, Rosenthal, B. N., Singh, N. B., "On line Control of Solid-Liquid Interface", International Journal of Control, submitted.

37. Leephakpreeda, T, Batur, C., “ Distributed Crystallinity Control During Cast Film Extrusion”, *International Polymer Processing*, Vol. XII, December 1997, pp. 373-377, 1997.
38. Leephakpreeda, T, Batur, Celal., “Stability Analysis of Fuzzy Control System”, *Thammasat Int. Journal*. Vol. 2, No. 1, pp1-6, 1997.
39. Kasparian, V., Batur C., “Model Reference Based Neural Network Adaptive Controller”, *ISA Transactions*, Volume 37, No.1, pp. 21-39, 1998.
40. Batur, C., Duval, M. B. W., Bennett, R. J., “ Control and design of crystal growth furnace”, *ISA Transactions* 38, pp. 73-85, 1999.
41. Leephakpreeda,T. and Batur, C. (1997). A Design Sensitivity Analysis for Crystallinity Control,*Thammasat International Journal of Science and Technology*, Vol. 2, No. 2, pp. 18-23.
42. Leephakpreeda,T. and Batur, C. (1997). A Design Sensitivity Analysis for Crystallinity Control, *Thammasat International Journal of Science and Technology*, Vol. 2, No. 2, pp. 18-23.
43. Leephakpreeda,T. and Batur, C. (1997) Modelling of Local Crystallinity in Polymer Extrusion Process, *Research and Development Journal of The Engineering Institute of Thailand*, Vol. 7, No. 2, pp. 76-81.
44. Leephakpreeda,T. and Batur, C. (1997). Stability Analysis of a Fuzzy Control System, *Thammasat International Journal of Science and Technology*, Vol. 2, No.1, pp.1-5.
45. Batur, C. and Leephakpreeda,T.(1996). Optimization of Crystallinity Distribution in Sheet Extrusion, *Journal of Inverse Problems in Engineering*, Vol. 4, pp. 153-176.
46. Batur, C., Vhora, M. H., Cakmak, M., Serhatkulu, T. “ On line crystallinity measurement using laser Raman spectrometer and neural network”, *ISA Transactions*, 38, pp. 139-148, 1999.
47. Batur, C., Srinivasan A., Duval, W. M. B, Singh, N. B., Golovaty, D., “ On line control of solid liquid interface by state feedback, *Journal of crystal growth*, 205, pp 395-409, 1999.
48. Nizami, J., Batur, C., Nizami, J., Batur, C., “Stability Analysis and Controller Design for Polymer Sheet Extrusion” *Journal of Vibration and Control*, 6, 1083-1105, 2000.
49. Seidensticker, R.G., Rosch, W.R., Mazelsky, R., Hopkins, R.H., Singh, N.B., Coriell, S.R., Duval, W.M.B., Batur, C” Active control of interface shape during crystal growth of lead bromide”, *Int. Journal of Crystal Growth*, 198/199, pp. 988-994, 1999.

50. Ergungor Z., Cakmak M., Batur C., "Effect of Processing Conditions on the Development of Morphology in Clay Nanoparticle Filled Nylon-6 Fibers", *Macromolecular* , 185, 259-276 (2002).
51. Islam, M. S., Husain.I, Veillette, R., Batur, C.," Design and Performance Analysis of Sliding Mode Observers for Sensorless Operation of Switched Reluctance Motors", *IEEE Trans. On Control System Technology*, pp:283-390, May 2003, Volume 11.
52. G. Song V. Chaudhry and C. Batur "Precision tracking control of shape memory alloy actuators using neural networks and sliding mode based robust controller", *Journal of Smart Materials and Structures*, 12, pp:223-231, 2003.
53. G. Song V. Chaudhry and C. Batur " A Neural Network Inverse Model for A Shape Memory Alloy Wire Actuator" , *Journal of Intelligent Material System and Structures*, Vol. 14, No: 6, pp.331-404, June 2003
54. W.M.B. Duval, C. Batur., H. Zhong, "Transient Mixing Driven by Buoyancy Flows", In submission to *Phys. of Fluids*.
55. Ergungor Z., Batur C, .Cakmak M., "On line Measurement of Crystallinity of Nylon-6 Nanocomposites by Laser Raman Spectroscopy and Neural Networks", *Journal of Applied Polymer Science*, Vol., 92 Issue: 1, 5 April 2004. pp. 474 - 483., 2004.
56. Srinivasan, A., Batur, C., Duval, W., "Limitations on Steady State Trackability of Distributed Parameter Systems", *Transactions on Dynamic Systems Measurement and Control*, accepted, 2005.
57. Batur, C., Sreeramreddy, T., K. Qais, " Sliding Mode Control of a Simulated MEMS Gyroscope, *ISA Transactions*, 44, pp. 99-108, 2006.
58. Z. Gubinyi, C. Batur, A. Sayir and F. Dynys; Electrical properties of PZT piezoelectric ceramic at high temperatures. *Journal of Electroceramics*, Article 9364, November 2007, on-line first.
59. M. Cakmak, Z. Erginger, C. Batur " Molecular origins of toughening mechanism in uniaxially stretched nylon-6 films with clay nano particles " *Polymer*, accepted POLYMER-07-2531R.
60. J. Fei, C. Batur, "Robust Adaptive Control for A MEMS Vibratory Gyroscope" *International Journal of Advanced Manufacturing Technology*, accepted.
61. S. Chandra and C. Batur, "Contact Angle Manipulation for Micro Gripping", In Review for *Journal of Microfluid Nanofluid*.
- 
62. J. Fei, C. Batur, "Adaptive sliding mode control with sliding mode observer for a MEMS vibrating gyroscope," *Proceedings of the Institution of Mechanical Engineers*,

Part I, Journal of System and Control Engineering 2008, 222(18), 839-849. [DOI: DOI 10.1243/09596518JSCE565], also in <http://journals.pepublishing.com/jsce>.

63. J. Fei, C. Batur, Robust adaptive control for a MEMS vibratory gyroscope, International Journal of Advanced Manufacturing Technology , ( in press), also in <http://dx.doi.org/10.1007/s00170-008-1591-5>.

64. J. Fei, C. Batur "A Novel Adaptive Sliding Mode Control for a MEMS Gyroscope" ISA Transaction Volume 48, Issue 1, January 2009, Pages 73–78

64. Batur, Celal, Cakmak, Miko; Yalcin, Baris; Druessedow, Charles “Pressure Control System for Electrospinning Process “ Journal of Polymer Engineering and Science Volume 50 Issue 4, April 2010. Also , published on line in Wiley Interscience (www.Interscience.wiley.com DOI 10.1002/pen.21587, 2009.

65. Fei, J. and Batur, C. A class of adaptive sliding mode controller with proportional–integral sliding surface. *Proc. IMechE, Part I: J. Systems and Control Engineering*, 2009, 223 (17), 989-999. DOI 10.1243/09596518JSCE712

66.. Chandra, S., Batur, C., “Contact Angle Manipulation for Microgripping“, Engineering Applications of Computational Fluid Mechanics Vol. 4, No. 2 (2010), pp. 181-195.

67. Duval Walter, Batur Celal, Z. Hui, “Experimental Investigation of Mixing Driven by Transient Buoyancy-Induced Flows ”, NASA Technical Report, NASATM-2014-216322,

68. Saied Taheri, Corina Sandu, Mehdi Ahmadian, Tomonari Furukawa, John Ferris, Celal Batur “ NSF I/UCRC Center for Tire Research (CenTiRe)-An Overview”, The International Journal of Vehicle Design, pp: 286-291. Vol 65, No 2, 2014 ISSN 0143-3369

69. Ken Chen<sup>1</sup>, Meng Zhang<sup>1</sup>, and Celal Batur “ KF vs. PF Performance Quality Observed from Stochastic Noises Statistics and Online Covariance Self-adaptation “Mechanical Engineering and Technology Advances in Intelligent and Soft Computing, 2012, Volume 125/2012, 291-298, DOI: 10.1007/978-3-642-27329-2\_40

70. Chen Ken, Zhao Pan, Batur Celal, Zhang Yun “ Aggregate Volumetric Estimation Based on PCA and Momentum Enhanced BP Neural Networks “ Journal of Electronics Vol 26, No 5 September 2009.

71. K Chen, S Yang, B Celal “Probe: Noise-and-rotation resistance of Hopfield Neural Network in imaged traffic sign recall”, Vol.30 No.2 JOURNAL OF ELECTRONICS, Springer, April 2013

72. Duval Walter, Z. Hui, C. Batur, "Mixing driven by transient buoyancy flows. I. Kinematics," 17 in *Physics of Fluids* (Vol.30, Issue 5), May 2018 . <https://doi.org/10.1063/1.5023026>  
DOI: 10.1063/1.5023026

73. Roja Esmaeeli, Haniph Aliniagerdroudbari, Seyed Reza Hashemi, Muapper Alhadri, Waleed Zakri, Celal Batur, Siamak Farhad" Strain-driven piezoelectric energy harvester for intelligent tires" 7th Global Conference on Global Warming (GCGW-2018) June 24-28, 2018, Izmir, Turkey

74. Saied Taheri, Corina Sandu, Mehdi Ahmadian, Tomonari Furukawa, John Ferris, Celal Batur " NSF I/UCRC Center for Tire Research (CenTiRe)-An Overview", *The International Journal of Vehicle Design*, pp: 286-291. Vol 65, No 2, 2014 ISSN 0143-3369

75. Duval Walter, Batur Celal, Z. Hui, "Experimental Investigation of Mixing Driven by Transient Buoyancy-Induced Flows", NASA Technical Report, NASATM-2014-216322,

76. Roja Esmaeeli, Haniph Aliniagerdroudbari, Seyed Reza Hashemi, Ashkan Nazari, Muapper Alhadri, Waleed Zakri, Abdul Haq Mohammed, Celal Batur, Siamak Farhad "A Rainbow Piezoelectric Energy Harvesting System for Intelligent Tire Monitoring Applications" [DOI: 10.1115/1.4042398], published online January 18, Omid Askari. *Transactions of Journal of Energy Resources Technology* Copyright VC 2019 by ASME June 2019, Vol. 141 / 062007-1.

77. Design, modeling, and analysis of a high performance piezoelectric energy harvester for intelligent tires Roja Esmaeeli Haniph Aliniagerdroudbari Seyed Reza Hashemi Muapper Alhadri Waleed Zakri Celal Batur Siamak Farhad *International Journal of Energy Research* First published: 08 March 2019 <https://doi.org/10.1002/er.4441>

## **B. REFEREED CONFERENCE PUBLICATIONS**

1. Batur C., Parmaksizoglu C., "Optimum Control in Air Conditioning", Proc. of 11. National Symposium on Heat Transfer, Istanbul Turkey. Vol. 1, pp. 378-384, 1979.

2. Batur,C., Kaya, A., "Microprocessor Controlled Robot Arm", 1981 ASEE Annual Conf. Proceedings, pp. 582-587. Published by the American Society of Engineering Education.

3. Batur, C., "Updating the Box and Jenkins Control System by Correlation Analysis", Proc. of the 1981 Joint Automatic Control Conference. Paper FA-8A, 1981. Published by JACC.

4. Batur, C., "Teaching the Analytical and Experimental Techniques on Microprocessor Based System Identification", Proceedings of the ASEE pp. 197-202, 1981. Published by the American Society of Engineering Education.
5. Batur, C., "On Line Identification of an Electrically Heated Liquid Delivery System", 12th Conference on Modeling and Simulation, ISA and IEEE publication, pp. 26-31, 1981.
6. Kaya, A., Batur, C., "Microprocessor Controlled Electric Process Heater", Proceedings of 1981 Joint Automatic Control Conference, JACC Vol. 11. Paper TP-2A.
7. Kaya, A., Dinibutun, T.A., Batur, C., Hizal, A., "Modeling of a Test Chamber for the Optimal Control of Environmental Conditions", Modeling and Simulation, Vol. 11, pp. 661-665, 1980. Published by ISA and IEEE.
8. Batur, C., "A Modified Algorithm for the Least Squares Identification", The ASME Winter Annual Meeting, paper no: 82-WA/DSC-9, 1982.
9. Batur, C., "How to Stabilize the Smith Control Scheme Despite Modeling Errors", 13th Conference on Modeling and Simulation. Modeling and Simulation, published by ISA and IEEE, pp. 127-129, 1982.
10. Batur, C., "Teaching Experimental Techniques for Microprocessor Based Digital Control", Proc. of the ASEE, pp. 99-102, 1982.
11. Batur, Celal., "A New Self-Tuning Controller for Dead Time Systems", 16th Conference on Modelling and Simulation. Modelling and Simulation, 1985, Vol. 16, pp. 639-645, Published by ISA and IEEE.
12. Batur, Celal., "Prediction of Stationary Disturbances of Unknown Mean Value", 16th Conference on Modelling and Simulation. 1985, Vol. 16, pp. 645-649. Published by ISA and IEEE.
13. Batur, Celal., Savage, Michael., "Introducing Micro-Computers into Conventional Measurement Laboratories", Proc. of the ASEE-North Central Section, Oct. 10-12, Vol. 1 pp. 240-243, 1985.

14. Batur, Celal., "Practical Robust Self Tuning Controllers", ISA International Conference. Conf. proceed., paper 86-2684, Vol.41, Part 1, pp. 567-574, Houston Texas, 1986, published by ISA.
15. Batur, Celal., "Stable Sub-optimum Controllers for the Smith Dead Time Compensation", American Control Conference (ACC), June 18-20 1986, Seattle, Washington, Proceedings of ACC, pp. 1354-1358. Paper No: 86CH2336-6.
16. Batur, Celal., Braun, M.J., "Microprocessor Implemented Sub-Optimum Smith Controllers for Temperature Control", IFAC Symposium on Microcomputer Application in Process Control, Conf. Proceed. pp. T7/1-5, July 22-25, 1986. Series editor E. Adali. Istanbul, Turkey.
17. Batur, Celal., "Application of Robust Self-Adaptive Control Strategies by Personal Computers", 17th Modelling and Simulation Conference. Modelling and Simulation, Vol.17, pp. 913-918, 1986, Published by ISA and IEEE.
18. Batur, C., Braun, J.M., Shaffer, T., Rose, B., "Computer Based Flow Visualization as an Instructional Tool for Fluid Dynamics", Proceedings of the 1987 Annual ASEE Conference, pp. 1-6. Published by the American Society of Engineering Education.
19. Padovan, J., Choy, F.K., Batur, C., "Seismic Induced Impeller/Blade Rubs in Rotating Power Plant Components", 5th National Congress, ASME PVP Conference, San Diego, 1987. Published in PVP Vol. 127, Book No. G00374.
20. Braun, M J., Batur, C., Ida, N., Rose, B., Hendricks, R.C., Mullen, R.L., "A Non Evasive Laser Based Flow Analysis for Thin Film Flows at Low Reynolds Numbers", ASME/JSME Heat Transfer Conference, March 1987, Hawaii, Conference Proceedings Vol. 2, pp.71-78, Therm-2C.
21. Batur, C., Braun M.J., "An Expert Image Processing System to Quantify Fluid Dynamics", Session EIS-3 of International Electronic Imaging Conference, Nov. 2-5, Boston, 1987.
22. Batur Celal., "Robust Self Tuning Control Strategy for Pressure Control", Proceedings of the ISA/Mid-America Conference, March 17-19, 1987, pp. 156-161, published by ISA.

23. Batur, Celal., "Self Tuning Based Identification and Control of Smith Control Systems", ASME Winter Annual Meeting, Miami Beach Florida. 85-WA/DSC, Vol. 1 pp. 185-188, published by ASME, 1985.
24. Batur, Celal., "Teaching Statistical Process Identification with Low Cost Computers", Proc. of ASEE-North Central Section, Oct. 10-12, Vol. 1, pp. 19-22, 1985, published by ASEE.
25. Batur, Celal., "Identification Techniques for Smith Predictor Controllers", Paper 86-WA/DSC-28. Winter Annual Meeting of ASME, Dec. 1986, published by ASME.
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85. Batur, Celal, Tawfik, M. "Projective Control of Electro Hydraulic Servo Systems", Proceedings of the 2001 American Control Conference, ISBN 0-7803-6495-3/01@2001ACC, pp:576-581.
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99. Batur, C., Fei, Juntao, “ Adaptive Sliding Mode Controller with Proportional and Integral Sliding Surface IMECE 2006 Paper Number: IMECE2006-13274
100. Batur, C., Fei, Juntao, “Adaptive Sliding Mode Control of MEMS Vibrational Gyroscope”, Paper Number: IMECE2006-13273 IMECE 2006
101. Santanu Chandra, Celal Batur, “Manipulation of Capillary Force by Electrowetting for Micromanipulation”, Nano Science Technology Institute (NSTI) Conference, MEMS Device Modeling, Boston, May 7-11, 2006
102. Santanu Chandra, Celal Batur , “Liquid Bridge Based Microgripper” , Proceedings of the ASME International Design Engineering Technical Conferences & Computers and Information in Engineering Conference , IDETC/CIE September 4-7, 2007, Las Vegas, Nevada

103. J. Fei and C. Batur “A Novel Adaptive Sliding Mode Controller for MEMS Gyroscope”, Proceedings of the 46th IEEE Conference on Decision and Control .New Orleans, LA, USA, Dec. 12-14, 2007 IEEE Catalog Number: 07CH37933C ISBN: 1-4244-1498-9 Library of Congress: 79-640961, ISSN: 0191-2216
104. Ken Chen; Gangyi Jiang; Celal Batur, “Enhanced Lowpass Filter Based Video Predictive Tracking for Target with High Mobility” 23rd Chinese Control and Decision Conference (2011 CCDC), May 23-25, 2011 in Mianyang, China.
105. Ken Chen, Shoujian Yang, Celal Batur “ Effect of Multi-hidden-layer Structure on Performance of BP Neural Network: Probe “2012 8th International Conference on Natural Computation (ICNC 2012)
106. Jiajia Shen ; Gangyi Jiang Batur, C “ Practical notes on corruption resistance of Hopfield neural network in Chinese characters pattern recall “ Natural Computation (ICNC), 2011 Seventh International Conference on Neural Computation, pp: 194 – 198, ISBN. 978-1-4244-9950-2
107. Ken Chen, Meng Zhang ; Batur, C. “Gaussage and online parameter based video tracking mode transition from KF to PF for optimal performance”. Control and Decision Conference (CCDC), 2012, pp: 1331 - 1336 , ISBN 978-1-4577-2073-4
108. Esmaeeli R., Alini H., Hashemi S.R., Alhadri M., Zakri W., Batur C., Farhad S. “ Strain Driven Piezoelectric Energy Harvester for Intelligent Tires” , 7<sup>th</sup> Global Conference On Global Warming, June 24-28, 2018, Izmir Turkey
109. Roja Esmaeeli, Haniph Aliniagerdroudbari, Seyed Reza Hashemi, Ashkan Nazari, Muapper Alhadri, Waleed Zakri, Abdul Haq Mohammed, Celal Batur, Siamak Farhad “ Optimization of a rainbow piezoelectric energy harvesting system for tire monitoring applications”, Proceedings of the 11th international conference on power & energy Icope-17 June 24-28, 2018, Florida, UsaPowerEnergy 2018-7496

## **ACTIVITY IN RESEARCH**

### **EXTERNALLY FUNDED RESEARCH PROJECTS**

Research on Optimum Control by Microprocessor to Save Energy in Buildings. Research supported by Inter University Research Council, Contract No. OBR-ER-2 May-Sept. 1981, (Co-PI).

**\$ 22,000**

Electronic drive and monitor system for the LVAD (=Artificial Heart), funded by the Cleveland Clinic Foundation, 1985, (Co - PI).

**\$ 9,000**

A totally implanted, self-contained, prosthetic bladder. Funded by the Akron City Hospital and the University of Akron, RG-925 \$2,855. Additional contributions: \$2,000 Akron City Hospital, \$2,000 College of Engineering ,with M.J. Braun, K. Mudry, J. Summers, 1986.

**\$ 6,885**

Equipment grant from the Department of Energy, Grant No: OR-62, 1987.

**\$ 6,990**

A non-intrusive flow visualization method for thin film technology. NAG3-675 (Co-PI). For the period 12/29/86 through 12/28/87.

**\$ 70,693**

Equipment grant for robotics laboratories, Nordson Corporation, Ohio, 1988.

**\$ 55,000**

Equipment grant from NASA, 1988.

**\$ 7,619**

A non-intrusive flow visualization method for thin film technology, NASA Grant 3-675. \$71,276. University of Akron matching fund \$15,000. December 87-December 88 (Co-PI).

**\$ 86,276**

Temperature and melt/solid interface control during crystal growth, NASA Grant, PI, 1988.

**\$ 41,382**

Support for the Motion and Control Lab. from Parker 1999-2001

**\$40,000**

Equipment grant for machine vision components and software for the robotics Lab. True Vision Company, 1988.

**\$ 2,000**

Adaptive control of interface by temperature and interface profile feedback in transparent multi-zone crystal growth furnace NASA, PI, 1989.

**\$ 18,920**

Further study on adaptive control of interface by temperature and interface profile feedback in transparent multi-zone crystal growth furnaces . NASA PI, 1990.

**\$ 15,655**

Westinghouse control system donation from Ohio Edison Company

**\$ 70,000**

Stereo imaging of interface shape during crystal growth in transparent furnaces, NASA, PI, 1991.

**\$ 44,743**

Multivariable adaptive control of interface for programmable multizone crystal growth furnace, NASA, PI 1991.

**\$ 32,593**

Data acquisition equipment, private donation April, 1991.

**\$ 5,000**

Stereo Imaging Based Particle Velocimeter, NASA Grant NCC3-231, PI, September 1991.

**\$ 15,800**

Program Excellence Grant. Computational Mechanics Group (A member of Computational Mechanics Group, first year funding).

**\$ 340,000**

Parker Hannifin Fluid Power Laboratory Support (Co-PI), 1992.

**\$ 70,000**

A Nasa Grant on, On-line Quantification of Crystal Surfaces by Stereo Imaging. June 1992, PI.

**\$ 11,633**

An Intelligent Control Methodology for Programmable Multizone Crystal Growth Furnaces, a supplemental fund, NASA 1992.

**\$ 1,000**

A Nasa Grant on, An Intelligent Control Methodology for Crystal Growth, 1/28/92, PI.

**\$ 33,112**

A Nasa Grant on, Crystal Growth Control, 2/28/93, PI.

**\$ 36,498**

A Nasa Grant on, Crystal Growth Control, 8/16/94, PI.

**\$ 10,000**

Hierarchical Structure Control of Polymer Sheet Casting Process Through Adaptive Control, Co-PI, US Army, 1994.

**\$ 117,500**

A Nasa Grant on Crystal Growth and Mixing Control, 1996, PI.

	<b>\$ 35,000</b>
A Nasa Grant on, Crystal Growth Control, July 1996, PI.	
	<b>\$ 9,700</b>
A Nasa Grant on, Crystal Growth Control, June 1997, PI.	
	<b>\$ 3,999.00</b>
A Nasa Grant on, Crystal Growth Control, June 1997, PI.	
	<b>\$ 30,000.00</b>
A Nasa Grant on, Crystal Growth Control, April 1997, PI.	
	<b>\$ 28,010.00</b>
“Acquisition of a Pulse Excimer Laser for Polymer Engineering and Crystal Growth Research” (Co-principal investigators: Dr. J. L. White, Dr. C. Batur) funded by the NSF, October 1997 to October 1999, <b>\$204,093</b> (\$61,228 in cost share from Univ. of Akron).	
Acquisition of NuralWare, neural network training software package NeuralWare Inc. , Co-PI April, 1998	<b>\$95,000.00</b>
Stereo Imaging Velocimetry of Mixing Driven by Buoyancy Induced Flow Fields NASA Glenn 5/15/2000-1/30/2003	<b>\$135,000</b>
Support for Parker Motion Control Lab., 2000,Parker Hannifin.	<b>\$12,500</b>
Support for Parker Motion Control Lab., 2004,Parker Hannifin.	<b>\$12,500</b>
OBR award for Polymer-Based Nanotechnology, Co-Pi, (a group of twenty faculty), 2002	<b>\$175,000.</b>
Gas Service Line Riser – leakage Research, Co-Pi, 2005 Public Utilities Commision of Ohio	<b>\$67,530</b>
Characterization of High Temperature Ceramics, PI, 2005 CWRU/Nasa Glenn	<b>\$130,000</b>
Stereo Imaging Velocimetry of Mixing Driven by Buoyancy Induced Flow Fields. Ohio Board of Regents, PI, 2004,	<b>\$20,000</b>
Support for Parker Motion Control Lab., 2005,Parker Hannifin.	<b>\$7,000</b>
Directionally Solidified Multifunctional Ceramics, Ohio Board of Regents, PI., 2006,	<b>\$6,090</b>

Support for Parker Motion Control Lab., 2006,Parker Hannifin.	<b>\$2,000</b>
Support for Parker Motion Control Lab., 2007,Parker Hannifin.	<b>\$12,000</b>
Support for Parker Motion Control Lab., 2008,Parker Hannifin.	<b>\$5,000</b>
Support for Parker Motion Control Lab., 2009,Parker Hannifin.	<b>\$37,000</b>
Support from Delphi for ME Department	<b>\$642,550</b>
Software Support (NX5) from Siemens for the ME Department, 2008-2009	<b>\$2,000,000</b>
NSF, I-UCRC Planning, 2010	<b>\$10,000</b>
NSF, I-UCRC, 2011-2012	<b>\$48,852</b>
NSF, I-UCRC, 2012-2013	<b>\$55,000</b>
NSF, I-UCRC, 2013-2014	<b>\$52,000</b>
NSF, I-UCRC, 2014-2015	<b>\$55,000</b>
NSF, I-UCRC, 2014-2015	<b>\$55,000</b>
NSF, I-UCRC, Phase II 2015-2022	<b>\$500,000</b>
Oxide Based Heterointerfaces for Extreme Environment Electronics, CASE/AFOSR, 2012	<b>\$34,625</b>
LuK- Lubrizol Wet Friction (Co-PI) 2012 2013	<b>\$90,000</b>

#### **B. INTERNALLY FUNDED RESEARCH PROJECTS**

Advanced control of heat exchangers by micro-processor and simple algorithms. Funded by the University of Akron, 1981 (Co-PI).

**\$ 3,500**

Optimization of energy use in existing buildings by self-adaptive control strategies. Funded by the University of Akron, PI.

**\$ 2,400**

Life extending design through artificial intelligence . October 1989- January 1991, PI. The University of Akron

**\$ 2,100**

Neural network based fault diagnosis for turbomachines, \$8,500 and a departmental match of \$4,250. 1990, PI. Research Challenge Enhancement Award.

**\$ 12,750**

Durability improvement of high performance machinery under extreme operating conditions, \$8,500 and a departmental match of \$4,250, Co-PI. 1990. Research Challenge Enhancement Award.

**\$ 12,750**

Determination of fractal measure by image processing and application to crystal growth. October 1990, PI.

**\$ 2,100**

Faculty Research Grant and OBR Research Challenge Award for Tuning Fuzzy Logic Controllers. April, 1994.

**\$ 3,500**

Internal Faculty Grant, Crystallinity Control and Measurement  
March 1998

**\$ 3,500**

Teaching Excellence Grant, 1998

**\$ 5,000**

## **V. ACTIVITY IN PROFESSION**

A member of Editorial Board, Intelligent Control and Automation (ICA).

A member of Editorial Advisory Board for ISA Transactions 2004-

Associate Editor of the ISA Transactions 2001-2004

Elected as the secretary for the Automatic Control Division of the Instrument Society of America, 1988-1990.

Panel member of the Identification Committee on the System Identification for the ASME, 1986- 1990.

Editor of the newsletter for the Automatic Control Systems Division of the Instrument Society of America, 1986 -1988.

Reviewer for the Trans. of the ASME System Dynamics Measurement and Controls.

Reviewer for the IFAC, International Federation of Automatic Control. Reviewer for the Control Systems Magazine of the IEEE.

Reviewer for the West Educational Publishing.

Elected to coordinate 1991 ISA International Spring Conference.

Consultant to the Instrument Society of America, 1990-.

Technical Review Chairman for American Control Conference and ISA Conference for the Instrument Society of America, 1992-.

A judge for the American Control Conference, Control Engineering Heritage Award, 2000.

Editor of Intelligent Control and Automation, ICA, ISSN Print: 2153-0653

ISSN Online: 2153-0661, Website: <http://www.scirp.org/journal/ica> 2010-

## **ORGANIZATION MEMBERSHIPS**

ISA, Instrument System Society of America

ASME, American Society of Mechanical Engineers, Fellow

IEEE, Institute of Electrical and Electronics Engineering

American Associations of Crystal Growers

Tire Society

## **AWARDS**

Best presentation award. 1988 American Control Conference.

United Nations Award for a two-week seminar in Turkey on Expert Systems.

Second best paper award. 1988 Instrument Society of America Conference.

Collateral Faculty to Ohio Aerospace Institute 1990- .

Faculty research associate to polymer engineering, 1988-.

Exceptional performance and accomplishment award. NASA Lewis Research Center, March 15, 1991.

Dean Louis A. Hill Jr. Award, College of Engineering , 1992.

Teaching excellence grant, 1998.

## **PATENTS**

US Patent Number 6,176,924B1 - Control of Transparent Multizone Crystal Growth Furnace, W. Duval,., C. Batur., R. J. Bennett, 2001.

US Patent Number 6,139,627, Transparent Multi-zone Crystal Growth Furnace and Method for Controlling the same, W. Duval,., C. Batur., R. J. Bennett , October 2000.