Melih Çakmakcı

Department of Mechanical
Engineering
Bilkent University
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EXPERIENCE

Bilkent University, Ankara, Turkey
Faculty of Engineering

Assistant Professor , September 2009- Current
Department of Mechanical Engineering

Responsibilities:
Research and Teaching activities on dynamic systems and control theory. Design and development Vehicle control systems and of smart mechatronic components. Development of the Dynamics Systems and Controls Laboratories. Curriculum Development and Summer Practice coordination.

Founder, *Smart Mechatronic Systems (SMechS) Research Group*. Group's activities focus on design and control of mechatronic systems using the latest theoretical and technological developments in the mechanical design and control theory fields.

Ford Motor Company, Dearborn, MI, USA
Research and Advanced Engineering Division

Senior Research Engineer , April 2005- August 2009
Model Based Vehicle Control Systems Department

Responsibilities:

Lead engineering teams developing dynamic vehicle model-in-the-loop (MIL) and hardware-in-the-loop (HIL) models used in distributed vehicle controller development and testing; present and review development task plans with program and management teams by way of regular meetings.

Achievements/Experience:

Designed, implemented and validated a modular HIL model structure compliant with corporate modeling standards which was implemented for the hybrid electric vehicle project developed for multiple brands and engineered in multiple geographical locations.

Led the development of a fuel cell vehicle simulation model and delivered distributed vehicle system controller model.

Designed a model based control development case for the Ford Flexray in-vehicle communications network standard development project.

Research Engineer, July 2001- March 2005
Vehicle Electronics and Systems Department

Responsibilities:

Carry out development of dynamic vehicle models and control algorithms for novel powertrain systems; perform evaluation, robustness and algorithm integrity analysis of supervisory control systems; optimize complex emulation models for real-time implementation.

Achievements/Experience:

Received Six Sigma Green Belt Certification for successful completion of the "Reduction of System Power Violations for the Production Hybrid Electric Vehicle" project (participated as the team leader).

Developed methods and executed high level functional design verification tests for the production hybrid electric vehicle high voltage battery control algorithms.

Participated in Ford's first Design for Six Sigma project for control system design.

Developed and maintained a software-in-the-loop model for various prototype hybrid electric vehicle supervisory controllers.

Contracted Research Engineer, July 1999- June 2001
Transmission and Engine Systems Department
Vehicle Electronic Systems Department

Responsibilities:

Develop dynamic vehicle models and control algorithms for novel powertrain systems; design, implement and test control algorithms with advanced rapid control prototyping tools (ETAS, dSPACE, SWRI RPECS); carry out experimentation and data acquisition design, calibration and installation of hardware components; develop automatic code generation procedures for hardware-in-the-loop testing and emulations for real-time implementations.

Achievements/Experience:

Implemented a rapid controller prototyping system for the Ford Camless Engine Project.

Designed a real-time laminar flow element error correction algorithm for engine airflow speed density experiments.

Developed throttle characterization, intake manifold and cylinder dynamics under pulsating flow for high fidelity internal combustion engine modeling.

Carried out translation of complex MatrixX/Systembuild models to equivalent Matlab/Simulink models.

Developed a model-to-code process for Ford Research hardware-in-the-loop laboratory.

Investigated fuel efficient alternatives for hybrid electric vehicles by way of performing static and dynamic simulations for various series and parallel hybrid powertrain configurations.

University of Michigan, Ann Arbor, MI, USA
Department of Mechanical Engineering

Research Assistant, September 1997-May 1999

Responsibilities:

Conduct research on modularity and modular optimization of complex dynamic systems; participate in the Design and Integration Team activities at the Engineering Research Center for Re-configurable Machining Systems (ERC/RMS)

Conducted an industrial survey on the use of Tool Monitoring Systems among North American machine tool manufacturers and end user companies.

Developed a force feedback controller for SCARA robot arm for operation on smooth surfaces.

Carried out inaugural development and administration of the ERC Reconfigurable Manufacturing Systems Website (May 1999- May 2000).

Turkish Aerospace Industries Inc., Ankara, Turkey

Internship, Summer 1996

Worked for the HD-19 Regional Airliner structural design team in the Design and Development Department.

Turk-FIAT Tractor Inc., Ankara, Turkey

Internship, Summer 1995

Surveyed production techniques and quality control systems used across company's manufacturing facilities.

EDUCATION **University of Michigan, Ann Arbor, MI, USA**

Ph.D. in Mechanical Engineering, (January 2002-May 2009)
*Dissertation Title: "*Mechatronic Design for Component-Swapping Modularity using Bi-Directional Communication in Networked Control Systems"

Selected Related Coursework: Multivariable Control Systems, Non-Linear Systems and Control, Communication Networks, Vehicle Control Systems.

M. S. in Mechanical Engineering (September 1997- May 1999)
Dissertation Title: "Modular Design of a DC-Motor and Feedback Controller System"

Selected Related Coursework: Modeling and Simulation of Dynamic Systems, Design of Digital Control Systems, Design Optimization, Design of Micro-Electromechanical Systems.

M.E.T.U, Ankara, Turkey

B. S. in Mechanical Engineering, (September 1993-June 1997)

Selected Related Coursework: Design of Control Systems, Dynamics of Machinery, Advanced Mechanical Vibrations and Acoustics, Strength of Materials, Numerical Methods.

Achievements/Experience:

Ranked 1st academically among all graduating ME seniors.

Designed and manufactured a load-carrying vehicle that will operate on non-uniform 3D railway profile as part of a student team

Developed simulation for human body parts in a harmonically excited 2DoF vehicle.

BOOKS & BOOK CHAPTERS	1. Ulsoy, A. G., H. Peng and M. Cakmakci, "Automotive Control Systems", May 2012, Cambridge University Press.
	2. Book Chapter in Simulation Foundations, Methods and Applications, 'Simulation-based Engineering', Çakmakcı, M., Kızıltaş, G., Durak U., August 2017, Springer

JOURNAL PAPERS	1. M. Cakmakci and A.G. Ulsoy, "Improving Component Swapping Modularity using Bi-directional Communication in Networked Control Systems," IEEE/ASME Transactions on. Mechatronics, Vol. 14, No. 3, June 2009, pp 307-316.
	2. M. Cakmakci and A.G. Ulsoy, "Modular discrete optimal Mimo controller for a Vct engine," IEEE Transactions on Control Systems Technology. Vol. 19, No. 5, Sept. 2011, pp 1168-1177.
	3. Erva Ulu,, Nurcan Gecer-Ulu,, Çakmakcı, M. (2014). "Development and Validation of an Adaptive Method to Generate High-Resolution Quadrature Encoder Signals", Journal Dynamic Systems Measurement and Control, v.136(3) p.034503
	4. Gecer-Ulu, N., Ulu, E., Çakmakcı, M. (2016). "Design and Analysis of A Modular Learning Based Cross-Coupled Control Algorithm for Multi-Axis Precision Positioning Systems", *International Journal of Control Automation and Systems*, v.14(1)
	5. Dokuyucu, H.I., Çakmakcı, M. (2016). "Concurrent Design of Energy Management and Vehicle Traction Supervisory Control Algorithms for Parallel Hybrid Electric Vehicles", *IEEE Transactions on Vehicular Technology*, v.65(2)
	6. Karagöz, M., Cakmakci, M., *"Robust Multi-Axis Control of a Micro Milling Machine"*, ASME Journal of Dynamic Systems Measurement and Controls. (in press)

CONFERENCE PAPERS (REFEREED)	1. M. Cakmakci and A.G. Ulsoy, "Quantification of Coupling for Modular Design Problems," Proc. of the Japan-USA Symposium on Flexible Automation, Ann Arbor, July 2000.
	2. M. Cakmakci and A.G. Ulsoy, "Bidirectional Communication Among "Smart" Components in a Networked Control System," Proc. American Control Conference, Portland, OR, June 2005.
	3. M. Cakmakci and A.G. Ulsoy, "Improving Component Swapping Modularity using Bi-directional Communication in Networked Control Systems," Proc. Int. Symposium on Flexible Automation, Osaka, Japan, July 2006.
	4. M. Cakmakci and A.G. Ulsoy, "Design of Modular Controllers for Systems with Smart Networked Components," 4th Int. Conf. on Design and Production of Machines and Dies/Molds, Çesme, Turkey, June 2007.

5. Y. Zhao, Z. Yan, A. Malik, J. Blankenship and M. Cakmakci, "Development of a Hardware-In-The-Loop System for a Hybrid Powertrain Vehicle Control," Proceedings of the SAE Global Powertrain Congress, Chicago, USA, October 2008.

6. M. Cakmakci and A. G. Ulsoy, "Modular Discrete Optimal MIMO Controller for a Vct Engine," Proceedings of the American Control Conference, St. Louis, Missouri, USA, June 2009.

7. S.F. Li, M. Cakmakci, I. V. Kolmanovsky, and A.G. Ulsoy, "Throttle Actuator Swapping Modularity Design for Idle Speed Control, " Proceedings of the American Control Conference, St. Louis, Missouri, USA, June 2009.

8. M. Cakmakci and A. G. Ulsoy, "Combined Component Swapping Modularity for a Vct Engine Controller," Proceedings of the Dynamic Systems and Control Conference, October 2009.

9. M. Cakmakci, Y. Li, S. Liu, "Development of a multi-purpose Model-in-the Loop Simulink Vehicle Model for Ford Fuel Cell Vehicle Program," Proceedings of the American Control Conference, San Francisco, June 2011

10. E. Akgun and M. Cakmakci, "Development of a Supervisory Controller for Residential Energy Management Problems", Proceedings of the IEEE/ASME 2012 American Control Conference, Motreal Canada.

11. Dokuyucu, H.I., and Cakmakci M., " Concurrent Design of Energy Management and Vehicle Stability Algorithms for a Parallel Hybrid Vehicle using Dynamic Programming", Proceedings of the IEEE/ASME 2012 American Control Conference, Montreal, Canada.

12. Gecer-Ulu,N., Ulu E. and Cakmakci M.,"Development of a Modular Single-axis Slider for High Precision Positioning Applications", Proceedings of the 15th UMTIK 2012 Conference, Denizli, June 2012.

13. Gecer-Ulu,N., Ulu E. and Cakmakci M.,"Learning Based Cross-Coupled Control For ultiaxis HighPrecision Positioning Systems", Proceedings of the ASME DSCD Conference, Ft. Lauderdale, October 2012

14. Ulu E., Gecer-Ulu,N. and Cakmakci M.," Adaptive Correction and Look-up Table Based Interpolation of Quadrature Encoder Signals", Proceedings of the ASME DSCD Conference, Ft. Lauderdale, October 2012

15. Ristevski, S., Cakmakci, M.," Mechanical Design and Position Control of a Modular Mechatronic Device (MechaCell)", in Proceedings of the IEEE/ASME International Conference on Advanced Intelligent Mechatronics, July 2015, Busan, Korea.

16. Ristevski, S., Cakmakci, M.," Mathematical Model For Coordinated Motion Of Modular Mechatronic Device (Mechacell)", in Proceedings of the ASME Dynamic Systems and Control Conference, October 2015, Columbus, USA.

17. Z. Ali, E. B. Türeyen, Y. Karpat, M. Çakmakcı, " Fabrication of Polymer Micro Needles for Transdermal Drug Delivery System using DLPbased Projection Stereo-lithography", 18th CIRP Conference on Electro Physical and Chemical Machining (ISEM XVIII) Tokyo-Japan.

18. E.B. Türeyen, Y. Karpat and M. Çakmakcı, "Development of an Iterative Learning Controller for Polymer based Micro-Stereolithography Prototyping Systems", 2016 American Control Conference, 2016.

19. S. Kerimoğlu and M. Çakmakcı, "Modelling and Cross-Coupling Controller Development for a 6DOF Laser Micro-Machining System", 2017 American

Control Conference, 2016.

RESEARCH FUNDING	1. "Development of a Self Sufficient Modular Mechatronic Device and Its Proof of Concept with a Workpiece Positioning Study." EU REA Marie Curie Reintegration Grant, November 2010-November 2014, Project Budget: €100,000.
	2. "Development of a three-axis nano-positioning system through linear motor control". TUBITAK 1001 Scientific and Technological Research Grant, November 2010-November 2012 , Project Budget: 210,000TL.
	3. "Development of an MEMS Acoustical Vector Sensor". Undersecretariat for Defense Industry Grant, August 2013-August 2016, 2,200,000TL. (Collaboration with Meteksan Defense Industries, Inc.).
	4. "Development of an Multipurpose Micro Manufacturing System using Modular and Iterative Learning Control Algorithms". TUBITAK 1001 Scientific and Technological Research Grant, October 2013-March 2016 , Project Budget: 183,650TL.
TECHNICAL REPORTS & PRESENTATIONS	1. M. Cakmakci, R.G. Landers and A. G. Ulsoy, "ERC/RMS Technical Report: Results of a Survey on Tool Monitoring Systems," ERC for Reconfigurable Machining Systems at University of Michigan, 1998. Ann Arbor, MI.
	2. M. Cakmakci, M. Mehrabi and A. G. Ulsoy, "State-of-the-art in Reconfigurable Machining Systems, Volume II," ERC for Reconfigurable Machining Systems at University of Michigan, Ann Arbor, MI.
	3. J. Kotwicki and M. Cakmakci, "LFE Measurement Correction for ESM/MAF Delete Engine Tests," FRL Technical Memo, September 2000, FRL, Dearborn, MI.
	4. M. Jankovic, K. Bailey, S. Cikanek, R. Baraszu, and M. Cakmakci, "Dynamic Model for the DOE LSR Hybrid Electric Vehicle," FRL Technical Report, 2001, FRL, Dearborn, MI.
	5. M. Cakmakci and R. Baraszu, "Xmath/SystemBuild to Matlab/Simulink Migration Process," FRL Technical Report, 2001, FRL, Dearborn, MI.
	6. "Reduction of System Power Violations for HEV", Six Sigma Greenbelt Project Management Review, November 2004, Product Development Engineering, Dearborn, MI.
	7. "Proposal for a Rapid HIL Development Process", Department Meeting Presentation, December 2005, FRL, Dearborn, MI.
	8. "Model Based Flexray Network Design", Department Meeting Presentation, April 2006, FRL, Dearborn, MI.
	9. "Status of Model Based Flexray Project", Chief Engineer Review, July 2006, FRL, Dearborn, MI.
	10. "Vehicle Control System Development Process", University of Michigan ME564 Guest Lecture, October 2006, Ann Arbor, MI.
	11. "Status of CISG+ERAD HIL Testbench", Chief Engineer Review, February 2007, FRL, Dearborn, MI.
	12. Y. Zhao, Z. Yan, A. Malik, J. Blankenship and M. Cakmakci, "Development of a Hardware-In-The-Loop System for a Hybrid Powertrain Vehicle Control," FRL Technical Report, 2009, FRL, Dearborn, MI.
	13. M. Cakmakci, Y. Li, S. Liu, "Development of a MIL/HIL Oriented Simulink Vehicle Model for Ford Fuel Cell Vehicle Program," FRL Technical Report, 2009, FRL, Dearborn, MI. (w/ Bilkent U. Affiliation)

TEACHİNG ACTIVITIES And SERVİCE	ME 565 Dynamics (F09,F10,F11,F12,F13) ME 578 Vehicle Control Systems (new course)(F09,F10) ME579 Adaptive Control Systems (S10,S11) ME584 Int. to Mechatronic Systems (S10) (ME484 in Mosul University) ME 102 Systems Engineering (S11,S12): ME341 Dynamics and Controls I (F11,F12,F13,F14,F15,F16) ME342 Dynamics and Controls I (S12,S13,S14,S15,S16,S17) ME440 Automotive Engineering (S13,F15,F16) ME299 and ME399 Summer Practice Coordinator (2010-2014)
PROFESSIONAL & LEADERSHIP ACTIVITIES	Mechanics Track Co-Chair for ASME 2010 ESDA Conference. Organizer and host of the Ford Research and Advanced Engineering Control Systems Seminars (January 2006-Current), Organizer and host of the Hardware-in-the-Loop Technical Discussion Series, Member of the Hybrid and Fuel Cell Research Team Employee Recognition Selection Committee (April 2004-December 2005), Co-developer and co-investigator, Ford Motor Company – University of Michigan joint research project: "Design for Swapping Modularity Case Study: Series HEV Controller". Consultant for HIL Testing and Automatic code generation methods for Ford Hybrid Escape program (2005-2006). Technical Reviewer, American Control Conference, Conference on Decision and Control IEEE Transactions on Mechatronics, ASME Dynamic Systems and Vibrations, Journal of Automatic Control, IEEE Transactions on Control Systems Technology Member, ASME, IEEE, SAE. ASME Dynamic Systems and Control Division Webmaster (2012-2013) and Member of the Executive Committee. Associate Editor to 2015 Dynamic Systems and Control Conference on track topics 'Surface Robotics' and 'Vehicle Motion Control'. March 2015-October 2015 Jury Member for the Best Student Paper Competition at the 2015 Dynamic Systems Measurement and Controls Conference, Oct 2015. Associate Editor to 2017 Dynamic Systems and Control Conference on track topics 'Fuel Cell Systems'. March 2017-October 2017
GRADUATE STUDENT SUPERVISION	Emre Akgün,M.S., "Development Of A Supervisory Controller For Energy Management Problems," Graduated August 2011. Now with ANDRITZ HYDRO GmbH Erva Ulu, M.S., "Mechatronic Design of a Modular Precision Positioning System", Graduated August 2012. Now Ph.D. student at CMU. Nurcan Gecer Ulu, M.S., "MIMO Control of a 3-Axis Modular Precision Positioning System", Graduated: August 2012. Now Ph.D. student at CMU. Halil İbrahim Dokuyucu, M.S., "Concurrent Design of Automotive Control Systems-Powertrain+Vehicle Stability Example", Graduated August 2012. Now with Ministry of Foreign Affairs. Stefan Ristevski, M.S., "Distributed Positioning of a Workpiece using MechaCells", Graduated: August 2015. Now with CNCtech in Macedonia. Alper Yasin Tiftikci, M.S., Thesis Topic: "Sensing Tip Analysis and Design for an Acoustic Vector Sensor", Graduated: August 2016. Research Engineer, TAI.

Erkan Buğra Türeyen, M.S., Thesis Topic: "Mechatronic and Iterative Controller Design for a Multi-Purpose Micro Prototyping System", Expected Graduated: August 2016, Research Engineer, Roketsan.

Mümtazcan Karagöz, M.S., Thesis Topic: "Design and Analysis of a Multi-Purpose 3D Micro Positioning System", Graduated: August 2016. Research Engineer, TAI.

Serhat Kerimoğlu, M.S., Thesis Topic: "3D Contour Error Minimizing Controller Design for Laser Machining System", Graduated: August 2016. Research Engineer, TAI.

Müge Özcan, M.S., Thesis Topic: "Design and Control of Smart Materials", Expected Graduation: August 2018. (co-advise w/ İ. Temizer)

Ozan Temiz, M.S., Thesis Topic: "Control-Oriented Vehicle Dynamics modeling for Electric Vehicles", Expected Graduation: August 2018.

AWARDS & HONORS

"Outstanding Undergraduate Student of the Year Award," 1996, M. E. T. U., Ankara, Turkey.

President's List of High Honor for Graduation, 1997, M. E. T. U., Ankara, Turkey.

Departmental Achievement Award: "Hybrid Electric Vehicle System Controller Implementation in Matlab/Simulink" 2001, FRL, Dearborn, MI.

Departmental Achievement Award: "Successful Controller Development and Implementation for the CISG-ERAD Hybrid Electric Vehicle Prototype," 2008, FRL, Dearborn, MI.

DSCC 2012 Best Paper in Session Award for paper presentation "Learning Based Cross-Coupled Control For Multi-axis High Precision Positioning Systems", October 2012.

ASME Dynamic Systems and Control Division Service Award, (July 2015)

'Docent in Mechanical Engineering' Degree from Higher Education Council of Turkey, (April 2016)

2016 Inspiring Teacher Award by ME Seniors. (award that is organized and conducted by the graduating seniors to select by voting the faculty member who had the most (positive) influence on their education)

SKILLS

Programming: C/C++, Pascal, Fortran, Java/Javascript, PHP, Python.

EngineeringSoftware:Matlab/Simulink/Stateflow/RTW, MatrixX/SystemBuild/AutoCode, Maple, 20Sim, ETAS/ASCED-SD, dSpace ControlDesk, GT-Power, Maple/Maplesim, Mathematica, Mathcad, Autocad, Cadkey, Pro-Engineer.

OS: Microsoft Windows NT/2000/9X/Vista/7, OSX, Unix, Linux, QNX, ERCOS-EK.