

Yildiray Yildiz

Assistant Professor, Mechanical Engineering Department, Bilkent University
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Education

Massachusetts Institute of Technology <i>Ph.D., Mechanical Engineering with Mathematics Minor</i>	MA, USA 2004–2009
Sabanci University <i>M.Sc, Mechatronics</i>	Istanbul, Turkey 2002–2004
Middle East Technical University <i>B.Sc, Mechanical Engineering</i>	Ankara, Turkey 1998–2002

Positions

Bilkent University <i>Assistant Professor</i>	Ankara, Turkey 2014–present
NASA Ames Research Center/UCSC <i>Associate Scientist</i>	CA, USA 2010–2014
NASA Ames Research Center/UCSC <i>Postdoctoral Scholar</i>	CA, USA 2009–2010

Visiting Positions

University of Michigan <i>Visiting Scholar</i>	Ann Arbor, USA 2015 August
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Honors and Awards

Outstanding Service Award from IEEE, 2020.

Research Incentive Award from Parlar Foundation. One of the only two recipients of the award from the Mechanical Engineering field in Turkey, 2018.

Young Scientist Award from Turkish Academy of Science (GEBIP), 2017.

Young Scientist Award from Science Academy (BAGEP), Turkey. The only recipient of the award from Mechanical Engineering field, 2017.

NASA Ames Technology Transfer Award, Software Release Award (group achievement): "Control Allocation Technique to Recover from Pilot Induced Oscillations (CAPIO) Through the Estimation and Minimization of Phase Lag Introduced to the System Due to Control Surface Rate Saturation," 2016.

NASA Honor Award, a group achievement award "for outstanding technology development of the CAPIO system at the Vertical Motion Simulator supporting NASA's Green Aviation Initiative," 2012.

Distinguished Lecturer, SCV Chapter on Computational Intelligence Society meetings, 2011.

Best student paper award, ASME Dynamic Systems and Control Conference, Ann Arbor, 2008.

Ranked 1st in the graduating class of Mechanical Engineers at Middle East Technical University, 2002.

Publications

Preprints

4) Köprülü, C., Yıldız, Y., "Act to Reason: A Dynamic Game Theoretical Model of Driving," arXiv:2101.05399, 2021.

3) Eraslan, E., Yildiz, Y., "Modeling, Control and Human-in-the Loop Stability Analysis of an Elastic Quadrotor," arXiv:2012.05747, 2020.

2) Temiz, O., Cakmakci, M., Yildiz, Y., "A Fault-Tolerant Integrated Vehicle Stability Control Using Adaptive Control Allocation," arXiv:2008.05697, 2020.

1) Tohidi, S. S., Yildiz, Y., "A Control Theoretical Adaptive Human Pilot Model: Theory and Experimental Validation," arXiv:2007.10216, 2020.

Journal Articles

25) Albaba, B. M., Musavi, N., Yildiz, Y., "A 3D Game Theoretical Framework for the Evaluation of Unmanned Aircraft Systems Airspace Integration Concepts," *Transportation Research Part C: Emerging Technologies*, in press, 2021.

24) Albaba, B. M., Yildiz, Y., "Driver Modeling through Deep Reinforcement Learning and Behavioral Game Theory." *IEEE Transactions on Control Systems Technology*, in press, 2021.

23) Tohidi, S. S., Yildiz, Y., "Handling actuator magnitude and rate saturation in uncertain over-actuated systems: A modified projection algorithm approach," *International Journal of Control*, in press, 2020.

22) Tian, R., Li, N., Kolmanovsky, I., Yildiz, Y., Girard, A. R. "Game-theoretic modeling of traffic in unsignalized intersection network for autonomous vehicle control verification and validation," *IEEE Transactions on Intelligent Transportation Systems*, in press, 2020.

- 21) Tohidi, S. S., Yildiz, Y., Kolmanovsky, I., "Adaptive Control Allocation for Constrained Systems," *Automatica*, vol. 121, 2020.
- 20) Eraslan, E., Yildiz, Y., Annaswamy, A. M., "Shared Control Between Pilots and Autopilots: Illustration of a Cyber-Physical Human System," *IEEE Control Systems Magazine*, vol. 40, no. 6, pp. 77-97, 2020.
- 19) Yildiz, Y. "Controlling a Launch Vehicle at Exoatmospheric Flight Conditions Via Adaptive Control Allocation," *Turkish Journal of Electrical Engineering and Computer Science*, vol. 28, pp. 2278-2287, 2020.
- 18) Albaba, B. M., Yildiz, Y., "Modeling Cyber-Physical Human Systems Via an Interplay Between Reinforcement Learning and Game Theory," *Annual Reviews in Control*, vol. 48, pp. 1-21, 2019.
- 17) Yildiz, Y. "Air Fuel Ratio Control Using Delay Resistant Closed Loop Reference Model Adaptive Control," *Journal of Aeronautics and Space Technologies*, vol. 11, no. 2, pp. 1-8, 2018.
- 16) Alan, A., Yildiz, Y., Poyraz, U., "Adaptive Pressure Control for Use in Variable Thrust Rocket Development," *IEEE Control Systems Magazine*, vol. 38, no. 5, pp. 26-52, 2018. **COVER ARTICLE**
- 15) Li, N., Oyler, D. W., Zhang, M., Yildiz, Y., Kolmanovsky I. V., Girard, A., "Game-Theoretic Modeling of Driver and Vehicle Interactions for Verification and Validation of Autonomous Vehicle Control Systems," *IEEE Transactions on Control Systems Technology*, vol. 26, no. 5, pp. 1782-1797, 2018.
- 14) Yucelen, T., Yildiz, Y., Sipahi, R., Youcef, E., Nguyen, N., "Stability Limit of Human in the Loop Model Reference Adaptive Control Architectures," *International Journal of Control*, vol. 91, no. 10, pp. 2314-2331, 2018.
- 13) Hussain, H., Yildiz, Y., Matsutani, M., Annaswamy, A. M., Lavretsky, E., "Computable Delay Margins for Adaptive Systems with State Variables Accessible," *IEEE Transactions on Automatic Control*, vol. 62, no. 10, pp. 5039 - 5054, 2017.
- 12) Yildiz, Y., Unel, M., Demirel, A. E., "Nonlinear Hierarchical Control of a Quad-Tilt-Wing UAV: An Adaptive Control Approach," *International Journal of Adaptive Control and Signal Processing*, vol. 31, no. 9, 2017.
- 11) Abidi, K., Yildiz, Y., Annaswamy, A. M., "Control of Uncertain Sampled-Data Systems: An Adaptive Posicast Control Approach," *IEEE Transactions on Automatic Control*, vol. 65, no. 2, pp. 2597-2602, 2017.
- 10) Musavi, N., Onural, D., Gunes, K., Yildiz, Y., "Unmanned Aircraft Systems Airspace Integration: A Game Theoretical Framework for Concept Evaluations," *AIAA Journal of Guidance, Control and Dynamics*, vol. 40, no. 1, pp. 96-109, 2017.

- 9) Abidi, K., Yildiz, Y., Korpe, B. E., "Explicit Time Delay Compensation in Teleoperation: An Adaptive Control Approach," *International Journal of Robust and Nonlinear Control*, vol. 26, no. 15, pp. 3388-3403, 2016.
- 8) Acosta, D., Yildiz, Y., Craun, R., Beard, S., Leonard, M., Hardy, G., Weinstein, M., "Motion-Based Piloted Simulation Evaluation of a Control Allocation Technique to Recover from Pilot Induced Oscillations," *AIAA Journal of Aircraft*, vol. 52, no. 1, pp. 130-140, 2015.
- 7) Yildiz, Y., Brat, G., Agogino, A. "Predicting Pilot Behavior in Medium Scale Scenarios Using Game Theory and Reinforcement Learning," *AIAA Journal of Guidance, Control and Dynamics*, vol. 37, no. 4, pp. 1335-1343, 2014.
- 6) Backhaus, S., Bent, R., Bono, J., Lee, R., Tracey, B., Wolpert, D., Xie, D., Yildiz, Y., "Cyber-Physical Security: A Game Theory Model of Humans Interacting over Control Systems," *IEEE Transactions on Smart Grid*, vol. 4, no. 4, pp. 2320-2327, 2013.
- 5) Yildiz, Y., Annaswamy, A., Yanakiev, D., Kolmanovsky, I., "Spark Ignition Engine Idle Speed Control: An Adaptive Control Approach," *IEEE Transactions on Control Systems Technology*, vol. 19, no. 5, pp. 990-1002, 2011.
- 4) Yildiz, Y., Kolmanovsky, I., "Stability properties and cross coupling performance of the control allocation scheme CAPIO," *AIAA Journal of Guidance, Control and Dynamics*, vol. 34, no. 12, pp. 1190-1196, 2011.
- 3) Yildiz, Y., Annaswamy, A., Kolmanovsky, I., Yanakiev, D., "Adaptive Posicast Controller for Time-delay Systems with Relative Degree $n^* \leq 2$," *Automatica*, vol. 46, no. 2, pp. 279-289, 2010.
- 2) Yildiz, Y., Annaswamy, A., Yanakiev, D., Kolmanovsky, I., "Spark Ignition Engine Fuel-to-Air Ratio Control: An Adaptive Control Approach," *Control Engineering Practice*, vol. 18, no. 12, pp. 1369-1378, 2010.
- 1) Yildiz, Y., Sabanovic, A., Abidi, K., "Sliding-Mode Neuro-Controller for Uncertain Systems," *IEEE Transactions on Industrial Electronics*, vol. 54, no. 3, pp. 1676-1685, 2007.

Book Chapters

- 3) A. M. Annaswamy, Y. Yildiz, "Cyber-Physical-Human Systems," in *Encyclopedia of Systems and Control*, J. Baillieul, T. Samad, Ed. Springer, London, 2020.
- 2) N. Li, M. Zhang, Y. Yildiz, I. Kolmanovsky, A. Girard, "Game theory-based traffic modeling for calibration of automated driving algorithms," in *Control Strategies for Advanced Driver Assistance Systems and Autonomous Driving Functions*, 1st ed., vol. 476, H. Waschl, I. Kolmanovsky, F. Willems, Ed. Springer, Cham, 2019, pp. 89-106.
- 1) K. Erbatur, Y. Yildiz, A. Sabanovic, "Sliding Modes in Fuzzy and Neural Network Systems," in *Variable Structure Systems: from Principles to Implementation*, 1st ed., vol. 66, A. Sabanovic, L. M. Fridman, S. Spurgeon, S. K. Spurgeon, Ed. London: IET, 2004, pp. 245-264.

Conference Papers.....

- 46) Habboush, A., Yildiz, Y., "Modeling Pilot-Flight Control System Interactions in the Presence of Uncertainty," AIAA Scitech 2022, accepted for publication, 2022.
- 45) Eraslan, E., Yildiz, Y., "Modeling and Adaptive Control of Flexible Quadrotor UAVs," IEEE Conference on Decision and Control, accepted for publication, 2021.
- 44) Albaba, B. M., Musavi, N., Yildiz, Y., "A 3D Modeling Framework for the Application of Unmanned Aircraft Systems Integration," IEEE Conference on Control Technology and Applications, accepted for publication, 2021.
- 43) Koprulu, C., Yildiz, Y., "Act to Reason: A Dynamic Game Theoretical Driving Model for Highway Merging Applications," IEEE Conference on Control Technology and Applications, accepted for publication, 2021.
- 42) Tohidi, S. S., Yildiz, Y., Kolmanovsky, I., "Sliding mode control for over-actuated systems with adaptive control allocation and its applications to flight control," IEEE Conference on Control Technology and Applications, accepted for publication, 2021.
- 41) Tohidi, S. S., Yildiz, Y., "Discrete Adaptive Control Allocation," American control conference, accepted for publication, 2021.
- 40) Koru, A. T., Arabi, E., Dogan, K. M., Yucelen, T., Sipahi, R., Yildiz, Y., "Set-Theoretic Model Reference Adaptive Control for Performance Guarantees in Human-in-the-Loop Systems; A Pilot Study," AIAA Scitech Forum, 2020.
- 39) Albaba, M., Yildiz, Y., Li, N., Kolmanovsky, I., Girard, A., "Stochastic driver modeling and validation with traffic data," American Control Conference, pp. 4198-4203, 2019.
- 38) Tohidi, S. S., Yildiz, Y., "Adaptive Human Pilot Model for Uncertain Systems," European Control Conference, pp. 2938-2943, 2019.
- 37) Temiz, O., Cakmakci, M., Yildiz, Y., "Adaptive Control Allocation with Communication Delay for In-Wheel Propulsion Electric Vehicles," IFAC Workshop on Distributed Estimation and Control in Networked Systems, vol. 52, no. 20, pp. 157-162, 2019.
- 36) Arabi, E., Yucelen, T., Sipahi, R., Yildiz, Y., "Human-in-the-Loop Systems with Inner and Outer Feedback Control Loops: Adaptation, Stability Conditions, and Performance Constraints," AIAA Scitech Forum, 2019.
- 35) Su, G., Li, N., Yildiz, Y., Girard, A., Kolmanovsky, I., "A traffic simulation model with interactive drivers and high-fidelity car dynamics," IFAC Cyber Physical Human Systems Conference, vol. 51, no. 34, pp. 384-389, 2019.

- 34) Tian, R., Li, S., Li, N., Kolmanovsky, I., Girard, A., Yildiz, Y., "Adaptive game-theoretic decision making for autonomous vehicle control at roundabouts," IEEE Conference on Decision and Control, pp. 321-326, 2018.
- 33) Temiz, O., Cakmakci, M., Yildiz, Y., "A Fault Tolerant Vehicle Stability Control Using Adaptive Control Allocation," ASME Dynamic Systems and Control Conference, 2018.
- 32) Tohidi, S. S., Yildiz, Y., Kolmanovsky, I., "Pilot Induced Oscillation Mitigation for Unmanned Aircraft Systems: An Adaptive Control Allocation Approach." IEEE Conference on Control Technology and Applications (CCTA), pp. 343-348, 2018.
- 31) Li, N., Kolmanovsky, I. V., Girard, A., Yildiz, Y., "Game Theoretic Modeling of Vehicle Interactions at Unsignalized Intersections and Application to Autonomous Vehicle Control," American Control Conference, pp. 3215-3220, 2018.
- 30) Yousefi, E., Demir, D. F., Sipahi, R., Yucelen, T., Yildiz, Y., "Effects Of Linear Filter On Stability And Performance Of Human-in-the-Loop Model Reference Adaptive Control Architecture," ASME Dynamic Systems and Controls Conference, 2017.
- 29) Yousefi, E., Yildiz, Y., Sipahi, R., Yucelen, T., "The Effect of Remote-Signal Feedback Architecture on the Stability of Human-in-the-Loop Telerobotics in the Presence of Time-Delays," IEEE Conference on Control Technology and Applications (CCTA), pp. 1288-1293, 2017.
- 28) Alan, A., Yildiz, Y., Poyraz, U., "Adaptive Pressure Control Experiment: Controller Design and Implementation," IEEE Conference on Control Technology and Applications (CCTA), pp. 80-85, 2017.
- 27) Tohidi, S. S., Yildiz, Y., Kolmanovsky, I. V., "Adaptive Control Allocation for Over-Actuated Systems with Actuator Saturation," IFAC World Congress, IFAC-PapersOnLine, vol. 50, no. 1, pp. 5492-5497, 2017.
- 26) Dibaji, S. M., Yildiz, Y., Annaswamy, A., Chakraborty, A., "Delay-Aware Control Designs of Wide-Area Power Networks," IFAC World Congress, IFAC-PapersOnLine vol. 50, no. 1, pp. 79-84, 2017.
- 25) Yousefi, E., Yildiz, Y., Sipahi, R., Yucelen, T., "Stability analysis of a human-in-the-loop telerobotics system with two independent time-delays," IFAC World Congress, IFAC-PapersOnLine, vol. 50, no. 1, pp. 6519-6524, 2017.
- 24) Alan, A., Yildiz, Y., Poyraz, U., "Pressure Control of Cold Air Testing Plant with Delay Resistant Closed-loop Reference Model Adaptive Control," AIAA Science and Technology Forum and Exposition, paper no. AIAA 2017-0121, 2017.
- 23) Yucelen, T., Yildiz, Y., Sipahi, R., Youcef, E., Nguyen, N., "Stability Analysis of Human-Adaptive Controller Interactions," AIAA Science and Technology Forum and Exposition, paper no. AIAA 2017-1493, 2017.

- 22) Oyler, D., Li, N. I., Zhang, M., Yildiz, Y., Girard, A., Kolmanovsky, I., "Hierarchical Reasoning Game Theory Based Approach for Evaluation and Testing of Autonomous Vehicle Control Systems," IEEE Conference on Decision and Control, pp. 727-733, 2016.
- 21) Tohidi, S. S., Yildiz, Y., Kolmanovsky, I., "Fault Tolerant Control for Over-Actuated Systems: An Adaptive Correction Approach," American Control Conference, pp. 2530-2535, 2016.
- 20) Oyler, D., Yildiz, Y., Girard, A., Kolmanovsky, I., "A Game Theoretical Model of Traffic with Multiple Interacting Drivers for Use in Autonomous Vehicle Development," American Control Conference, pp. 1705-1710, 2016.
- 19) Musavi, N., Tekelioglu, K. B., Yildiz, Y., Gunes, K., Onural, D., "A Game Theoretical Modeling and Simulation Framework For The Integration Of Unmanned Aircraft Systems In To The National Airspace," AIAA Infotech @ Aerospace, paper no. AIAA-2016-1001, 2016.
- 18) Yildiz, Y., Annaswamy, A., "Robust Adaptive Posicast Controller," IFAC Workshop on Time-Delay Systems, vol. 48, no. 12, pp. 398-403, 2015.
- 17) Abidi, K., Yildiz, Y., "On the Discrete Adaptive Posicast Controller," IFAC Workshop on Time-Delay Systems, vol. 48, no. 12, pp. 422-427, 2015.
- 16) Alan, A., Yildiz, Y., Poyraz, U., "Gas Generator Pressure Control in Throttleable Ducted Rockets: A Classical and Adaptive Control Approach," AIAA/SAE/ASME Joint Propulsion Conference, paper no. AIAA 2015-4236, 2015.
- 15) Yildiz, Y., Unel, M., Demirel, A. E., "Adaptive Nonlinear Hierarchical Control of a Novel Quad Tilt-Wing UAV," European Control Conference, 2015.
- 14) Abidi, K., Yildiz, Y., Korpe, B. E., "Explicit Adaptive Time-Delay Compensation for Bilateral Teleoperation," IEEE Chinese Control and Decision Conference, pp. 3379-3383, 2015.
- 13) Yildiz, Y., Brat, G., A. Agogino, "Predicting Pilot Behavior in Medium Scale Scenarios Using Game Theory and Reinforcement Learning," AIAA Modeling and Simulation Technologies Conference, paper no. AIAA-2013-4908, 2013.
- 12) Craun, R., Acosta, D., Beard, S., Leonard, M., Hardy, G., Weinstein, M., Yildiz, Y., "Motion-Based Piloted Simulation Evaluation of a Control Allocation Technique to Recover from Pilot Induced Oscillations," AIAA Guidance, Navigation, and Control Conference, paper no. AIAA-2013-4926, 2013.
- 11) Yildiz, Y., Brat, G., Lee, R., "Using Game Theoretic Models to Predict Pilot Behavior in NextGen Merging and Landing Scenario," AIAA Modeling and Simulation Technologies Conference, paper no. AIAA-2012-4487, 2012.
- 10) Yildiz, Y., "The Effect of Explicit Adaptive Time Delay Compensation on Time Delay Margin," AIAA Guidance, Navigation, and Control Conference, paper no. AIAA-2011-6440, 2011.

- 9) Abidi, K., Yildiz, Y., "Discrete-Time Adaptive Posicast Controller for Uncertain Time-Delay Systems," AIAA Guidance, Navigation, and Control Conference, paper no. AIAA-2011-6442, 2011.
- 8) Yildiz, Y., Kolmanovsky, I., "A Control Allocation System for Automatic Detection and Compensation of Phase Shift Due To Actuator Rate Limiting," American Control Conference, pp. 444-449, 2011.
- 7) Yildiz, Y., Kolmanovsky, I., "Implementation of CAPIO for Composite Adaptive Control of Cross-Coupled Unstable Aircraft," AIAA Infotech@Aerospace, paper no. AIAA-2011-1460, 2010.
- 6) Yildiz, Y., "Adaptive Control For Time Delay Systems Applied To Flight Control," AIAA Guidance, Navigation, and Control Conference, paper no. AIAA-2010-7576, 2010.
- 5) Yildiz, Y., Kolmanovsky, I., "Stability properties and cross coupling performance of the control allocation scheme CAPIO," AIAA Infotech@Aerospace, paper no. AIAA-2010-347, 2010.
- 4) Yildiz, Y., Kolmanovsky, I., "A Control Allocation Technique to Recover From Pilot Induced Oscillations (CAPIO) Due To Actuator Rate Limiting," American Control Conference, pp. 516-523, 2010.
- 3) Yildiz, Y., Annaswamy, A., Yanakiev, D., Kolmanovsky, I., "Automotive Powertrain Control Problems Involving Time Delay: An Adaptive Control Approach," ASME Dynamic Systems and Control Conference, pp. 1421-1428, 2008. **BEST STUDENT PAPER AWARD**
- 2) Yildiz, Y., Annaswamy, A., Yanakiev, D., Kolmanovsky, I., "Adaptive Air Fuel Ratio Control for Internal Combustion Engines," American Control Conference, pp. 2058-2063, 2008.
- 1) Yildiz, Y., Annaswamy, A., Yanakiev, D., Kolmanovsky, I., "Adaptive Idle Speed Control for Internal Combustion Engines," American Control Conference, pp. 3700-3705, 2007.

Other Contributions

D. Acosta, Y. Yildiz and D. Klyde, "Avoiding Pilot-Induced Oscillations in Energy-Efficient Aircraft Designs," The Impact of Control Technology , T. Samad and A.M. Annaswamy (eds.), *IEEE Control Systems Society*, 2014.

Service

Member, Board of Governors, IEEE Control Systems Society, 2020 term

Associate Editor, IEEE Transactions on Control Systems Technology, 2020 - present

Editorial Advisory Board Member, International Journal of Control, 2019 - present

Associate Editor, European Journal of Control, 2019 - present

Associate Editor, IEEE Control Systems Magazine, 2016 - present

Conference Editorial Board Associate Editor, IEEE, 2015 - present

Operating Committee Member, 2018 IFAC Conference on Cyber-Physical and Human Systems

Associate Editor, 2018 IEEE Control and Decision Conference

Associate Editor, 2018 European Control Conference

Associate Editor, 2018 American Control Conference

Associate Editor, 2017 IEEE Conference on Control Technology and Applications

Associate Editor, 2017 IEEE Control and Decision Conference

Associate Editor, 2017 American Control Conference

Technical Associate Editor for the Adaptive and Learning Systems Area, IFAC 2017 World Congress

Associate Editor, 2016 IEEE Control and Decision Conference

Associate Editor, 2016 American Control Conference

Organizer of the tutorial session, "Game Theoretical System Modeling and Control: Theory and Applications" 2015 European Control Conference

Program Committee Member, 2014 International Joint Conference on Autonomous Agents and Multiagent Systems

Area Co-Chair, 2014 SCITECH Guidance Navigation and Control

Associate Editor, 2013 American Control Conference

Judge, Best Paper, 2012 Guidance Navigation and Control Conference

Area Co-Chair, 2011 AIAA Guidance Navigation and Control Conference

Associate Editor, 2010 IEEE Conference on Decision and Control

Associate Member, AIAA Guidance Navigation and Control Technical Committee, 2010 - 2013