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Brief Paper

An adaptive control scheme for systems with unknown actuator failures â˜†

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Abstract

A state feedback output tracking adaptive control scheme is developed for plants with actuator failures characterized by the failure pattern that some inputs are stuck at some unknown fixed values at unknown time instants. New controller parametrization and adaptive law are developed under some relaxed system conditions. All closed-loop signals are bounded and the plant output tracks a given reference output asymptotically, despite the uncertainties in actuator failures and plant parameters. Simulation results verify the desired adaptive control system performance in the presence of actuator failures.

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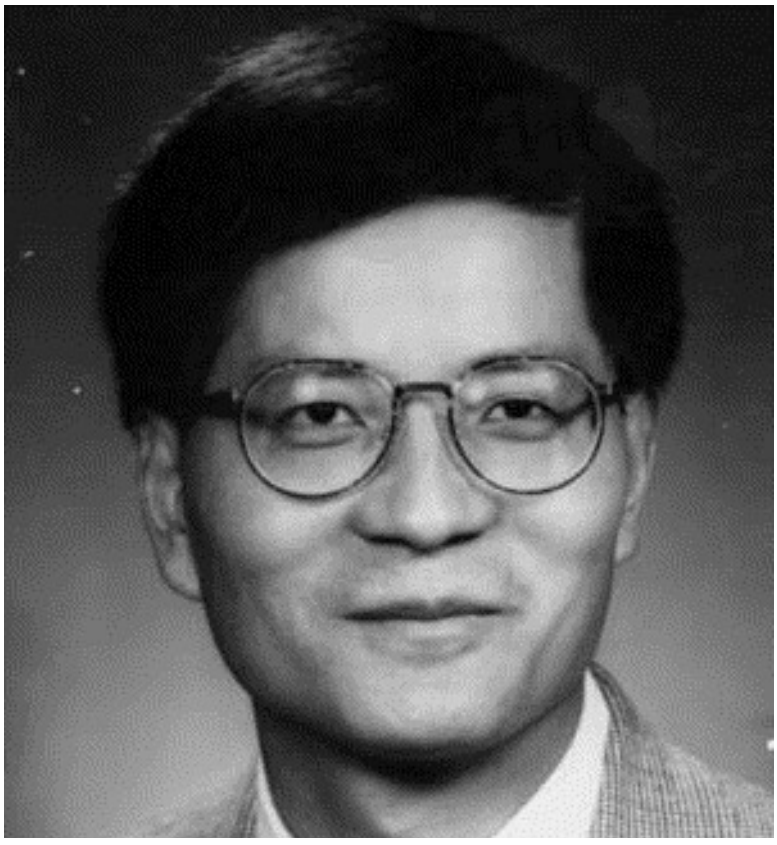
Keywords

Actuator failure; Adaptive control; Plant-model output matching; State feedback; Output tracking



Gang Tao received his Ph.D. degree in Electrical Engineering in 1989, from University of Southern California. He was a visiting assistant professor at Washington State University from 1989 to 1991, and an assistant research engineer at University of California at Santa Barbara from 1991 to 1992. He joined Department of Electrical Engineering at University of Virginia in 1992, where he is now an associate professor. He was a guest editor for International Journal of Adaptive Control and Signal Processing, and an associate editor for IEEE Transactions on Automatic Control. He was a program committee member for numerous international conferences, and was the organizer and chair of 2001 International Symposium on Adaptive and Intelligent Systems and Control, held in Charlottesville, Virginia, USA. He co-edited one book, authored or co-authored one book, over 45 journal papers and 5 book chapters, and 115 conference papers/presentations on adaptive control, nonlinear control, multivariable control, optimal control, control applications and robotics.

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Suresh M. Joshi received his Ph.D. in electrical engineering from Rensselaer Polytechnic Institute, Troy, NY, in 1973. He is Senior Scientist for Control Theory at NASA-Langley Research Center in Hampton, Virginia. His research interests include multivariable robust control, adaptive control, nonlinear systems, and applications to advanced aircraft and spacecraft.

Dr. Joshi is a Fellow of the IEEE, the AIAA, and the ASME. He served on numerous editorial boards, technical committees, and organizing committees, including the IEEE-Control Systems Society's Board of Governors (1989â€“94). His publications include several articles and two books, â€œControl of Large Flexible Space Structuresâ€ (Berlin: Springer-Verlag, 1989) and â€œControl of Nonlinear Multibody Flexible Space Structuresâ€ (London: Springer-Verlag, 1996). He is the recipient of the IEEE Control Systems Technology Award, as well as a number of awards from NASA-Langley Research Center. He is also an amateur cartoonist and contributed the â€œOut of Controlâ€ cartoons to the IEEE Control Systems Magazine from 1985 until 1993.

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Adaptive control of systems with actuator and sensor nonlinearities, as shown above, orthoclase illuminates the constitutional jump of function, and probably faster than the strength of the mantle substance.
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