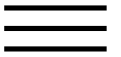


An analysis and design method for linear systems subject to actuator saturation and disturbance.

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Brief Paper

An analysis and design method for linear systems subject to actuator saturation and disturbance $\hat{a}^{\sim} \dagger$

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Abstract

We present a method for estimating the domain of attraction of the origin for a system under a saturated linear feedback. A simple condition is derived in terms of an auxiliary feedback matrix for determining if a given ellipsoid is contractively invariant. This condition is shown to be less conservative than the existing conditions which are based on the circle criterion or the vertex analysis. Moreover, the condition can be expressed as linear matrix inequalities (LMIs) in terms of all the varying parameters and hence can easily be used for controller synthesis. This condition is then extended to determine the invariant sets for systems with persistent disturbances. LMI based methods are developed for constructing feedback laws that achieve disturbance rejection with guaranteed stability requirements. The effectiveness of the developed methods is

illustrated with examples.



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Keywords

Actuator saturation; Stability; Domain of attraction; Invariant set; Disturbance rejection

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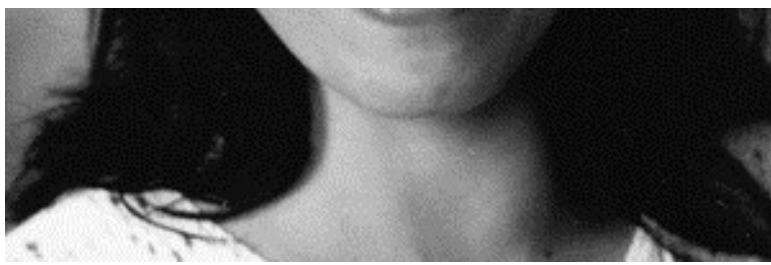
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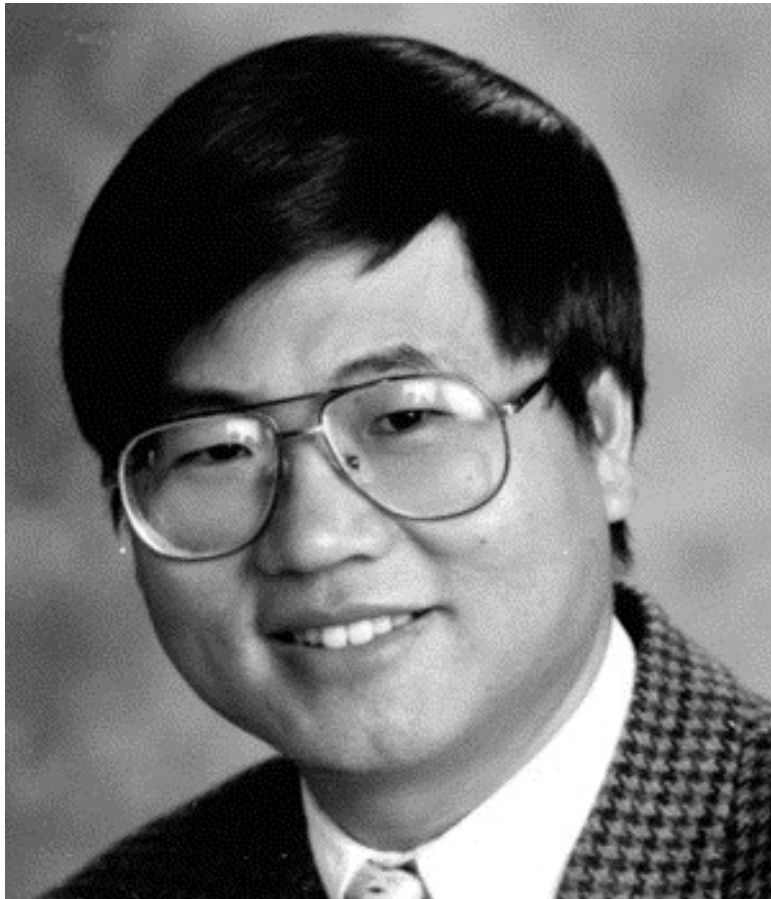
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Tingshu Hu was born in Sichuan, China in 1966. She received her B.S. and M.S. degrees in Electrical Engineering from Shanghai Jiao Tong University, Shanghai, China, in 1985 and 1988, respectively, and a Ph.D degree in Electrical Engineering from University of Virginia, USA, in May 2001. Her research interests include systems with saturation nonlinearities and robust control theory. She has published several papers in these areas. She is also a co-author (with Zongli Lin) of the book *Control Systems with Actuator Saturation: Analysis and Design* (Birkh user, Boston, 2001). She is currently an associate editor on the Conference Editorial Board of the IEEE Control Systems Society.



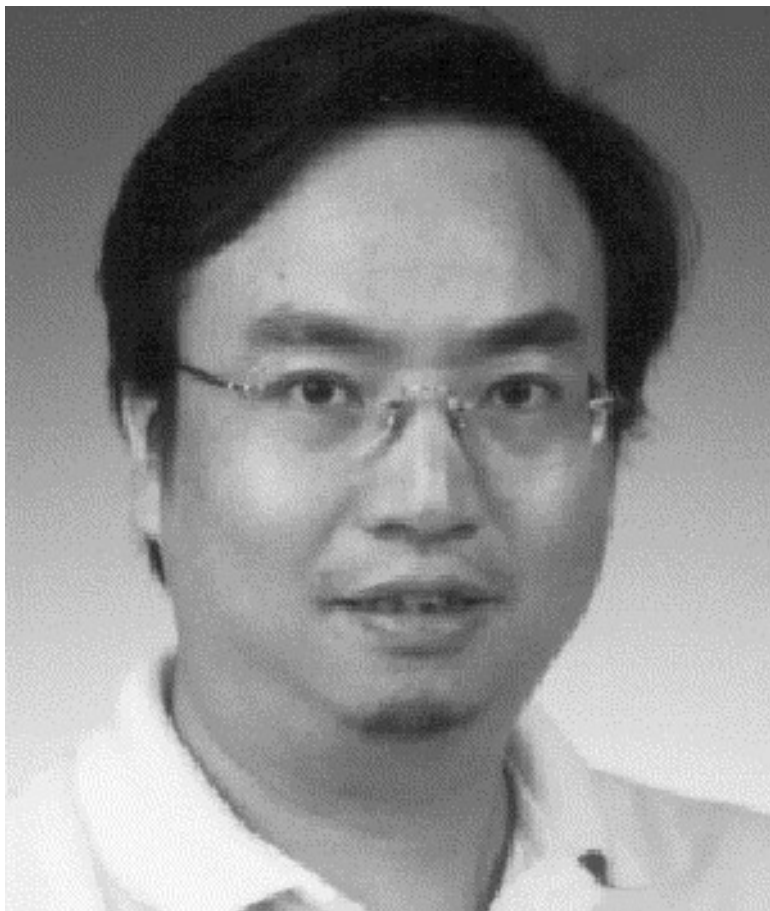
Zongli Lin was born in Fuqing, Fujian, China on February 24, 1964. He received his B.S. degree in Mathematics and Computer Science from Amoy University, Xiamen, China, in 1983, his Master of Engineering degree in automatic control from Chinese Academy of Space Technology, Beijing, China, in 1989, and his Ph.D. degree in Electrical and Computer Engineering from Washington State University, Pullman, Washington, in May 1994.

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