



南京信息工程大学

NANJING UNIVERSITY OF INFORMATION SCIENCE & TECHNOLOGY



自动化·智慧讲堂

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SUFFICIENT AND NECESSARY CONDITION FOR THE ASYMPTOTIC STABILITY OF STOCHASTIC SYSTEMS WITH DISCRETE TIME FEEDBACKS AND APPLICATIONS

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FEIQI DENG RECEIVED THE PH.D. DEGREE IN CONTROL THEORY AND CONTROL ENGINEERING FROM SOUTH CHINA UNIVERSITY OF TECHNOLOGY, GUANGZHOU, IN JUNE 1997. SINCE OCTOBER 1999, HE HAS BEEN A PROFESSOR WITH SOUTH CHINA UNIVERSITY OF TECHNOLOGY. HE IS CURRENTLY A SENIOR MEMBER OF IEEE, A MEMBER OF TECHNICAL COMMITTEE ON CONTROL THEORY (TCCT), CHINESE ASSOCIATION OF AUTOMATION (CAA), AND NOW HE IS A CAA FELLOW AND SERVING AS THE CHAIR OF THE IEEE CSS GUANGZHOU CHAPTER, THE DIRECTOR OF THE TCCT TECHNICAL COMMITTEE ON STOCHASTIC SYSTEM CONTROL, THE VICE EDITOR-IN-CHIEF OF JOURNAL OF SOUTH CHINA UNIVERSITY OF TECHNOLOGY, AND MEMBER OF THE EDITORIAL BOARDS OF THE JOURNALS: IEEE ACCESS, AIMS MATHEMATICS, MATHEMATICAL AND CONTROL, CONTROL THEORY AND APPLICATIONS AND ALL ABOUT SYSTEMS AND CONTROL. HIS MAIN RESEARCH INTERESTS INCLUDE STABILITY, STABILIZATION AND CONTROL OF COMPLEX SYSTEMS, INCLUDING TIME DELAY SYSTEMS AND STOCHASTIC SYSTEMS ETC.

ABSTRACT:

THE TALK IS CONCERNED WITH SOME ESSENTIAL FEATURES OF STOCHASTIC CONTROL SYSTEMS WITH SAMPLED DATA BASED (SCSWSDS). FIRSTLY IT IS SHOWN BY TWO PROPOSITIONS THAT THE MOMENT ASYMPTOTIC STABILITY OF THE UNDERLYING SYSTEM IS EQUIVALENT TO THAT OF ANY REGULAR ACCURATE NUMERICAL SCHEME UNDER SIMPLE CONDITIONS, WHICH IS CONVENIENT TO BE STRUCTURED SPECIALLY FOR SCSWSDS. THIS KIND OF PRINCIPLE PROVIDES A WAY FOR INFERRING MOMENT ASYMPTOTIC STABILITY OF SCSWSDS BY NUMERICAL SIMULATIONS LOGICALLY. THE ACCURATE SCHEME CONSTRUCTION PROCEDURE IS INTRODUCED IN A GENERAL FRAMEWORK AND ILLUSTRATED FOR THE QUASI LINEAR MODELS, THE MEAN SQUARE ASYMPTOTIC STABILITY OF LINEAR SCSWSDS IS INVESTIGATED AS THE FIRST APPLICATION OF THE PROPOSITIONS. IT IS FOUND THAT STOCHASTIC SYSTEMS MAY BE STABILIZED IN APPOINTED TIME BY SAMPLED DATA BASED CONTROL (SDBC). THE RESTRICTION TO THE UPPER BOUND OF THE SAMPLING PERIOD IS CONFIRMED BY THE WAY. THE ALMOST SURE STABILITY OF A KIND OF CONTROLLED SYSTEM WITH SAMPLED NOISE IS ANALYZED VIA THE DISCRETE SCHEME APPROACH AS THE SECOND APPLICATION OF THE PROPOSITIONS. THE CONCEPTS OF ACCURATE NUMERICAL COMPUTATION AND SIMULATION (ANCS) ARE PROPOSED. A DISTINCTIVE CHARACTER, SDBC-ONLY IN SHORT, FOR SDBC IS REPORTED AND STUDIED PRELIMINARILY BASED ON ANCS AND THE EQUIVALENCE PROPOSITIONS. SOME IMPORTANT REMARKS ARE GIVEN AS FURTHER ANALYSES ON SOME RELATED ISSUES. FINALLY, THREE NUMERICAL EXAMPLES ARE GIVEN TO ILLUSTRATE THE APPLICATIONS OF THE THEORETICAL RESULTS OF THE WORK.

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