CHAPTER 59

TECHNOLOGY
INSTRUMENTATION AND CONTROL
ENGINEERING

Doctoral Theses

465. AGARWAL (Vijayant)
Studies of Dynamics and Control of Robotic System Using Soft Computing Techniques.
Supervisors : Dr. B. C. Nakra and Dr. A. P. Mittal
Th 16426

Abstract

Investigates the numerical and Ai techniques available for solving kinematics and differential motions od the robots. The solution of inverse kinematics and trajectory planning with performance criteria for a redundant manipulator is proposed with softcomputing. A new search algorithm is applied for solving the inverse kinematics problem in certesian space as well as to find out the learning parameters of the Artificial neural network (ANN). The proposed method is tested for a two-joint robot planner manipulator. The fuzzy inference system is also suggested to solve the problem due to black box type approach of ANN.

Contents

466. GAUR (Prerna)
Intelligent Motion Control on Permanent Magnet A. C. Motors.
Supervisors : Prof. Bhim Singh, Prof. V. K. Bansal and Prof. A. P. Mittal
Th 16422

Abstract

The extensive investigations are made on the control of a Permanent Magnet Synchoronous Motor (PMSM) drive system. The PMSM has merits over other AC and DC motors. It has found wide applications in high performance applications such as industrial robots, satellite, aerospace actuators and machine tools, due to their high power density and high torque to interia ratio as compared to permanent magnet de commutator motors having same output capacity. The working of PMSM drive in vector control mode with different speed control techniques including conventional techniques such as PI (Proportional Integral), PID (Proportional Integral and Derivative), SMC (Sliding Mode Control) and artificial intelligent based controller techniques such as fuzzy logic, Artificial Neural Network (ANN) and Recurrent Neural Network (RNN).

Contents

467. HOTE (Yogesh Vijay)
New Approach of Kharitonov and Gerschgorin Theorem in Control Systems.
Supervisors : Prof. J. R. P. Gupta and Prof. D. Roy Choudhury
Th 16510

Abstract

Presents various simple approaches based on Kharitonov's theorem and the Gerschgorin theorem. Based on Kharitonov's theorem, routh criterion and their corollaries, various simplified and computationally effiecient approaches proposed for checking absolute stability, relative stability and controller design for uncertain systems. The Gerschgorin theorem and its related theory is studied using some numerical techniques, various simple methods presented for identification of real eigenvalues on the right half of the s-plane; hence the

stability, checking definiteness of a real symmetric matrix and its applications in Lyapunov stability analysis, determination of dominant and highest eigenvalue of a polynomial, reduced order modeling of linear systems.

Contents

1. Introduction. 2. Kharitonov's theorem. 3. New approach of testing robust stability of affine/multilinear uncertain systems. 4. Stability margin of interval systems. 5. Design of PD, PI and PID tuning strategy for interval plants. 6. Kharitonov's theorem in DU-DC converters. 7. Gereschgorin theorem. 8. Gerschgorin theorem in control system applications. 9. Gerschgorin theorem in interval systems. 10. Conclusions and future scope. Bibliography and appendixes.

468. JAIN (Pradeep Kumar)
Analysis and Design of a Novel Electric Propulsion System For Electric Vehicle.
Supervisors : Dr. Bhim Singh and Dr. A. P. Mittal
Th 16427

Abstract

Studies the design of electric vehicle propulsion system are thoroughly and keeping the vehicle operation difficulties in mind, the complete design of the motor drive system is carried out including rating of the motors, a power converter system and a battery rating. The electric propulsion system using vector control of IM and PMSM drives are modeled and simulated for a wide speed range such as strating, accelaration, deceleration (regenerative braking) and flux weakening (constant power region). The improvement in steady state and dynamic performance of dynamic performance of vector controlled IM and PMSM drives systems are obtained and highlighted for electric vehicle system.

Contents

1. Introduction. 2. literature review. 3. Design of electric vehicle propulsion system. 4. Speed sensoeless vector controlled induction motor (IM) drive electric vehicle. 5. Speed sensorless vector controlled Permanent Magnet Synchronous Motor (PMSM) drive for electric vehicle. Speed sensorless Direct Torque Control (DTC) Induction Motor (IM) drive system for electric vehicle. 7. Speed sensorless direct torque control (DTC) of PMSM

drive system for electric vehicle. 8. Main conclusions and scope of future work. 9. Bibliography and appendices.

469. VARSHNEY (Pragya)
Analysis and Synthesis of Switched Current and Swithced Capacitor Fractional Order Circuits.
Supervisors : Dr. Maneesha Gupta and Prof. G. S. Visweswaran
Th 16428

Abstract

Deals with the analysis and synthesis of swithced current (SI) and swithced capacitor (SC) frational order circuits. The fractional order differentiator (FOD) and integrator (FOI) models are obtained by discretization of some existing s-to-z operators. The operators are expanded for fractional powers of half using continued fraction expansion and the Taylor series expansion techniques. Being motivated by the simulation results of the half differentiator and half integrator models obtained using the existing first and order operators, a new first order operator has been suggested and its fractional order models developed. Comparisons of the suggested model with the existing model shows a perceptible improvement in performance of the fractional order circuit.

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