

Solution Of Polynomial Lyapunov And Sylvester Equations

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Stability of Polynomial Differential Equations: Complexity ...

Polynomial Lyapunov function Stability of a dynamical system with respect to finite perturbations can be established by finding a Lyapunov function. However, there is no general systematic method for constructing Lyapunov functions -- the discovery of such a function is dependent on the ingenuity and creativity of the investigator.

Common Polynomial Lyapunov Functions for Linear Switched ...

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Chaotic Particle Swarm Optimisation for Enlarging the ...

Etymology. The word polynomial joins two diverse roots: the Greek poly, meaning "many", and the Latin nomen, or name.It was derived from the term binomial by replacing the Latin root bi-with the Greek poly-.The word polynomial was first used in the 17th century.. Notation and terminology. The x occurring in a polynomial is commonly called a variable or an indeterminate.

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section (2.4), which are related to the Lyapunov Equation. 2.2 Four Lemmata from the Theory of Matrices and Polynomials Let R be the field of real numbers R[x] the ring of polynomials in x over R and R[x,y] the ring of polynomials in x and y over R. The elements of R[x] are denoted as p(x) and the elements of R[x,y] as h(x,y).

Nonlinear stability analysis of fluid flows using ...

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February, 1977 Report ESL-R-725 EXACT SOLUTION TO LYAPUNOV ...

approach, a Lyapunov function is characterized in terms of a quadratic difference form. As a main result, we derive a generalized Lyapunov stability theorem that the asymptotic stability of a behavior is equivalent to the solvability of the two-variable polynomial Lyapunov equation (TVPLE) whose solution induces the Lyapunov function. Moreover ...

Solution Of Polynomial Lyapunov And Sylvester Equations ...

A two-variable polynomial approach to solve the one-variable polynomial Lyapunov equation is proposed. Lifting the problem from the one-variable to the two-variable context gives rise to an associated lifted polynomial Lyapunov equa-tion which lives on a finite-dimensional vector space. This allows for the design of an iterative solution ...

Discovering polynomial Lyapunov functions for continuous ...

The simultaneous Lyapunov sector obtained here is the maximum sector for a certain choice of the Lyapunov matrix equation, or more specifically for an arbitrary positive definite matrix Q in eq. (27), which means that the thus obtained sector is not necessarily the maximum simultaneous Lyapunov sector for the given nonlinear feedback system.However, it should be emphasized that the ...

Constructing the Lyapunov Function through Solving ...

The main objective of this work consists of designing a swift optimising Lyapunov-based technique that allows the identification of the Lyapunov function coefficients. Subsequently, it exploits the resultant function in a heuristic optimising algorithm to maxim the region of ise attractions for the class of nonlinear polynomial systems.

Solution Of Polynomial Lyapunov And

Solution of polynomial Lyapunov and Sylvester equations 153 to the finite-dimensional subspace of pairs of R1-canonical matrices X21(ξ) and R2-canonical matrices X12(ξ). The problem of solving a PSE of the form (3) can always be reduced to that of solving a PSE in canonical form (4); see again Section 5

Solution Of Polynomial Lyapunov And Sylvester Equations

In the cases where the differential equations are polynomial, due to decidability of the theory of real-closed fields (Tarski, 1951), there is an algorithm that, for a given polynomial with parametric coefficients, decides whether there are instantiations of these parameters resulting in a local Lyapunov function.

A new algorithm to solve the polynomial Lyapunov equation

that common polynomial Lyapunov function is not uniformly bounded over all the UAS systems. This result answers a question raised by Dayawansa and Martin. A generalization to a class of piecewise-polynomial Lyapunov functions is given. Keywords: Switched systems, Stability, Polynomial Lyapunov function. AMS subject classifications: 93D20, 37N35.

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Lyapunov Based Analysis and Controller Synthesis for ...

can be described by polynomial functions. This method is based on sum-of-squares (SOS) optimization, which reduces the problem of finding a Lyapunov function for a polynomial system to one of constructing a polynomial function that satisfies a selection of algebraic conditions.

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A Generalized Lyapunov Stability Theorem for Discrete-Time ...

polynomial Lyapunov function for a planar or a homogeneous vector eld implies existence of a polynomial Lyapunov function that is sos and that the negative of its derivative is also sos. Amir Ali Ahmadi is a Goldstine Fellow at the Department of Business Analytics and Mathematical Sciences of the IBM Watson Research Center.

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A two-variable polynomial approach to solve the one-variable polynomial Lyapunov and Sylvester equations is proposed. Lifting the problem from the one-variable to the two-variable context gives rise to associated lifted equations which live on finite-dimensional vector spaces. This allows for the design of an iterative solution method which is inspired by the method of Faddeev for the ...

Polynomial sum of squares in fluid mechanics

We propose an approach for constructing Lyapunov function in quadratic form of a differential system. First, positive polynomial system is obtained via the local property of the Lyapunov function as well as its derivative. Then, the positive polynomial system is converted into an equation system by adding some variables. Finally, numerical technique is applied to solve the equation system.