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Lyapunov inequalities and applications. (English) Zbl 1470.35001

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This book provides an extensive survey of generalizations of the Lyapunov inequality. This book consists of eight chapters.

The first chapter provides an introduction, basic definitions, and some preliminary results. Hartman's inequality is proved, and an estimate is given for the distance between the zeros of the so-called Hill differential equation $x'' + q(t)x = 0$. In Chapter 2, the authors give a survey of the most basic results on Lyapunov-type inequalities for higher-order linear differential equations and sketch some recent developments related to this type of inequalities. Chapter 3 deals with second-order and third-order Lyapunov-type inequalities for half-linear differential equations. Lyapunov-type inequalities for nonlinear differential systems are studied in Chapter 4. In this chapter, the authors give a survey of the most basic results on Lyapunov-type inequalities for second-order nonlinear systems of differential equations under some boundary conditions. In Chapter 5, Lyapunov-type inequalities for fractional differential equations with Dirichlet and fractional boundary conditions are considered. Chapter 6 deals with Lyapunov-type inequalities for partial differential equations. In this chapter, L^p -Lyapunov-type inequalities for linear partial differential equations under Neumann boundary conditions are obtained, and a Lyapunov inequality for linear and quasilinear elliptic differential operators in N -dimensional domains is presented. Chapter 7 discusses second-order and even-order linear difference equations, linear Hamiltonian difference systems, quasilinear and nonlinear difference systems, and partial difference systems. In this chapter, some applications also are given such as disconjugacy criteria, stability, and some properties of Green's function. Finally, in Chapter 8, the authors discuss Lyapunov-type inequalities for linear, half-linear, and nonlinear dynamic equations on time scales, as well as linear Hamiltonian dynamic systems.

The text material of this book is presented in a readable and mathematically solid format. The book may be useful for mathematicians dealing with differential and difference equations and engineers.

Reviewer: [Alexander O. Ignatyev \(Donetsk\)](#)

MSC:

- [35-02](#) Research exposition (monographs, survey articles) pertaining to partial differential equations
- [35R11](#) Fractional partial differential equations
- [26A33](#) Fractional derivatives and integrals
- [34A08](#) Fractional ordinary differential equations

Cited in **2** Documents

Keywords:

[ordinary differential equations](#); [difference equations](#); [Hill differential equation](#); [partial differential equations](#); [dynamic equations on time scales](#); [Lyapunov inequality](#)

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