

Trigonometric spline approximation bounds on the solution of linear time-periodic systems

Jonas Denissen

Abstract

Linear time-periodic (LTP) systems arise in various applications, e.g. wind turbines, fans, pumps and nonlinear systems linearized about a periodic trajectory.

We investigate bounds on the solution of such LTP systems. Floquet-Lyapunov transformations yield linear time-invariant systems which have been studied exhaustively and well-known bounds exist. Optimal constants for these bounds can be determined by differential calculus for norms of matrix functions. Chebyshev approximations are uniformly convergent but its bounds show a highly oscillatory behavior which can be avoided using spline approximation. Hence, we introduce a trigonometric spline approximation of the solution and its corresponding bound. Convergence results for the approximations are stated and bounds are discussed by means of numerical examples.