

Abstract:

Stability is a fundamental property of a solution of a system of differential equations. If the system is represented by a linear differential operator, then the negativity of its spectrum implies the stability of the solution, where the negativity of the spectrum means the absence of eigenvalues with positive real part. The analysis of the spectrum of the corresponding linear operator is used in the study of the stability of the pipe flow. Unlike in other systems, there are no analytic formulas for the eigenvalues of the linearized operator characterizing the stability of the pipe flow and the eigenvalues must be computed numerically. Numerous numerical experiments indicate that the spectrum of the operator is negative, and the pipe flow is stable for all values of the Reynolds number. However, no formal proof of this statement exists so far. The objective of the thesis is to compare the spectrum of the operator characterizing the stability of the pipe flow with the spectrum of a simpler operator for which the analytic formulas for the eigenvalues are available. The comparison of the spectra of the operators might be helpful in formulating conjectures concerning the analytical estimates for the operator characterizing the stability of the pipe flow.