THOMAS53

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Abstract

Reproduction of the historical (Thomas, 1953) calculation of eigenfunctions and eigenvalues of the Orr-Sommerfeld equation using what was certainly one of the first implementations of a compact-difference discretization on an electronic computer (although the discretization method per se was already known to Gauss and in the 1920's, as reported by Thomas himself).

Usage

Executing the program iterates the calculation for a set of discretizations of increasing density and produces a table of eigenvalues and their errors. Redirecting to a file and plotting the error versus number of steps (with alpha=1 and Re=5000, for example) reveals the fourth-order accuracy of the discretization.

References

L. H. Thomas The stability of plane Poiseuille flow. *Physical Review Letters*, 91:780–783, 1953. doi:10.1103/PhysRev.91.780.