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comfos-nasc2026@math.upd.edu.ph

Dependency on triangular shapes in bifurcation diagrams of stationary cavity flows

Shinya Uchiumi[*1]

[1]Saga University

*contact: uchiumi@cc.saga-u.ac.jp

We consider lid-driven cavity flow problems, which are boundary value problems for the stationary Navier-Stokes equations. These are often used as benchmark problems when the shape of the cavity are square [2]. The shapes of the vortices are often compared for various Reynolds numbers.

Although reports on the triangular cavity problems are relatively few compared to the square ones, we can observe various streamline patterns [1, 4]. These two papers deal with isosceles triangles, but the apex angles are different. We observe difference between the bifurcation diagrams of the stationary solutions in [1, 4].

In order to reveal different structure of two diagrams, we compute the triangular cavity problems by the finite element method (FEM) for various apex angles θ. We make bifurcation diagrams with focusing on θ by FreeFEM [3].

Keywords: stationary Navier–Stokes problem, lid-driven cavity problem, finite element method, bifurcation

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