2D and 3D isogeometric boundary element analysis of steady incompressible viscous flow

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On the basis of some recent work of the authors [1-3], a novel approach is presented to the boundary element analysis of steady incompressible viscous flow. Nurbs basis functions are used to describe both the geometry of the problem and the governing boundary unknowns (pressure and velocity).

A classical collocation approach is adopted in order to build the governing discretised integral equations. The nonlinear term of the governing differential equations is considered as a body force and it is dealt with the aid of bounding Nurbs curves/surfaces instead of subdividing into cells. A suitable mapping is adopted in order to compute the volume integral. Such an approach has the advantage to be capable to describe complex geometries with very few parameters and that no generation of cell occurs.

Both full and modified Newton-Raphson iteration schemes are used and compared to obtain the solution of the problem. Some numerical examples are presented in order to demostrate the efficiency of the procedure both with reference to a classical example that is available in literature, i.e. the forced cavity flow, and with the application to a practical example, i.e. an airfoil.

References

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