

Enriched Immersed Finite Element Method for Hele-Shaw Flows with Two Different Fluids

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ABSTRACT

Hele-Shaw equation describes the flows in the small gap. When two different fluids are separated by interface, the governing equations contains discontinuous coefficients and nonhomogeneous jump conditions [1]. To solve the interface problems, people often use FEM or FDM on fitted grids. However, one obtains complex data structure for discretized systems.

We introduce new uniform grid based numerical methods. We use the immersed finite element space for the pressure where the basis functions are modified so they satisfy the local flux continuous condition. To handle the discontinuous jump conditions, we define piecewise linear discontinuous bubble which satisfies the nonhomogeneous jump conditions [2]. Lastly, to be able to compute the accurate and stable numerical Darcy velocity, we enrich the IFEM space by piecewise constants. We can compute the velocity easily once the pressure is approximated. Once the vector fields are approximated, the level set is updated using the WENO scheme.

REFERENCES

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