LATTICE BOLTZMANN MODELLING OF PULSATILE FLOW USING MOMENT BOUNDARY CONDITIONS

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Pulsatile flow - driven by a periodic pressure gradient - is exemplified by blood flow in the vascular system. As a basic representation of this, here we use a LBE model to simulate pulsatile flow between two parallel plates. At solid boundaries, we apply both non slip and Navier-slip boundary condition by specifying various moments of the particle distribution function at the walls. We used a second-order SRT model and investigated grid convergence using two distinct approaches. In the first approach, we fixed both Reynolds (Re) and Womersley (W_o) numbers and varied relaxation time (τ) with grid size. In the second approach, we fixed Wo and τ. For the first approach, the numerical method converged, but not always to the appropriate analytical result. However, the second approach performed excellently showing second-order convergence to the correct result.

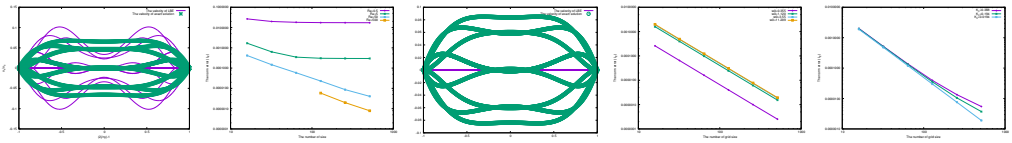

Figure 1: the first two figures are the results for first method and the others figures are for the second method for non-slip and slip boundary condition, respectively, at Womersley number $W_0 = 3.963$.

REFERENCES

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