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**A Memory Efficient Singular Finite Element Method for Flow of Viscoelastic Fluids**

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The rheological behaviour of viscoelastic fluids in a vicinity of singular point, where stress and pressure tend to infinity due to an abrupt change in boundary conditions, such as die-lip or a sharp edge corner of re-entrant flow, does not fully seem to be described. We developed the sector singular element placed in a small core around the singularity suitable for the finite element analysis of viscoelastic fluids; which has special interpolation functions in its radial direction taking into account the nature of the singularity, and ordinary elements were used in the rest of the domain. The problem was solved by 'decoupled method', which solves velocity-pressure fields and a stress field, alternatively, associated with the several numerical techniques developed by Iwata et al. so as to enhance upper limits of Weissenberg number. The sector singular finite element method (sector SFEM) is good at yielding smoother results even near the singularity, but poorer at convergency and the size of system core memory due to more complicated topology than the ordinary FEM. These disadvantages would cause serious problems for a flow simulation of multi-mode viscoelastic fluids or 3D analysis. Therefore, we developed the modified version of singular element (square SFEM). The feature of this element is as follows; (1) nodal points on the singularity are removed, (2) a topology of square singular element is almost the same as that of biquadratic element so as to make the most use of results obtained with the ordinary FEM, (3) a significant improvement in memory requirements and CPU time may be achieved owing to simplified topology and decoupled method even for the multimode viscoelastic flow analysis and 3D flow problems, (4) an improvement in convergence behaviour than sector SFEM.