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Computational modeling of red blood cells: A symplectic integration algorithm[1] ULF D. SCHILLER[2], ANTHONY J. C. LADD, Department of Chemical Engineering, University of Florida, Gainesville — Red blood cells can undergo shape transformations that impact the rheological properties of blood. Computational models have to account for the deformability and red blood cells are often modeled as elastically deformable objects. We present a symplectic integration algorithm for deformable objects. The surface is represented by a set of marker points obtained by surface triangulation, along with a set of fiber vectors that describe the orientation of the material plane. The various elastic energies are formulated in terms of these variables and the equations of motion are obtained by exact differentiation of a discretized Hamiltonian. The integration algorithm preserves the Hamiltonian structure and leads to highly accurate energy conservation, hence he method is expected to be more stable than conventional finite element methods. We apply the algorithm to simulate the shape dynamics of red blood cells.

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[2]also at Institute of Solid State Research, Research Center Juelich, Germany

Ulf D. Schiller
Department of Chemical Engineering, University of Florida, Gainesville

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