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purohit@seas.upenn.edu XIAOJUN LIANG, PRASHANT PUROHIT, University of Pennsylvania — The thermal fluctuations of lipid bilayer membranes are key to their interaction with cellular components as well as the measurement of their mechanical properties. Typically, membrane fluctuations are analyzed by decomposing into normal modes or by molecular simulations. Here we propose a new approach to calculate the partition function of a membrane. We view the membrane as a fluctuating von Karman plate and discretize it into triangular elements. We express its energy as a function of nodal displacements, and then compute the partition function and covariance matrix using Gaussian integrals. We recover well-known results for the dependence of the projected area of the membrane on the applied tension and recent simulation results on the dependence of membrane free energy on geometry, spontaneous curvature and tension. As new applications we compute the fluctuations of the membrane of a malaria infected cell and analyze the effects of boundary conditions on fluctuations. We also compare our calculation with some simulation method to show our time efficiency as well as accuracy.

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