



Università
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Modeling of Elastic Membranes in Liquid Lenses

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- Università degli studi di Palermo

Time : 12:00-13:00

In this presentation, a numerical calculation of deformation of a circular axisymmetric membrane of a liquid lens caused by the pressure of an optical liquid will be discussed. Since such deflections of the membrane are many times larger than the membrane thickness, a nonlinear model is applied and generalized relationships are derived that characterize the resulting shape with a high precision and permit an accurate analysis of imaging properties of the lens and of optical aberrations. Moreover, the optimal design of an axisymmetric membrane with variable thickness will be presented. It will be shown that the membrane thickness can be designed such that the prestressed membrane subjected to a given uniform liquid pressure deforms into a prescribed rotationally symmetric shape, e.g., a spherical or parabolic cap. For the special but important case of a spherical cap, a closed-form solution is derived. A numerical procedure is developed for the general case, and its high accuracy and efficiency is demonstrated by examples. This represents a joint work with Milan Jirásek and Filip Šmejkal from Czech Technical University in Prague.