
Asymptotic Analysis of Dynamic Problems for Elastic Shells

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By the method of asymptotic analysis we have got the three dynamic elastic shell models. First, we consider a family of linearly elastic Shells, clamped along their entire lateral face, all having the same middle surface. We make an essential geometrical assumption on the middle surface that the middle surface of shells is “Uniformly Elliptic”, the mapping of middle surface and the boundary for its definite domain are smooth enough. If the applied body force density is of order 0 with respect to the half thickness of shell, starting from the three-dimensional dynamic equations of linear elastic shell we get the two-dimensional dynamic equations of membrane shell by letting the thickness of shell go to zero.

Second, we consider a family of linearly elastic shells, all having the same middle surface. The shells are clamped on a portion of their lateral face, we make an essential geometrical assumption that the space of inextensional displacements contains non-zero functions. If the applied body force density is of order 2 with respect to the half thickness of shell, starting from the three-dimensional dynamic equations of linear elastic shell we get the two-dimensional dynamic equations of flexural shell by letting the thickness of shell go to zero.

Lastly, starting from the two-dimensional dynamic equations of Koiter’s shell we also get the two-dimensional dynamic equations of membrane shell and the two-dimensional dynamic equations of flexural shell by letting the thickness of shell go to zero, this gives the justification for the two-dimensional dynamic equations of Koiter’s shell.