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AUTHORS' REPLY

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The authors take a great interest in Dr Chen's comment in which various problems related to the application of our paper [1] have been addressed. The problems have been settled in our own way immediately after publishing the paper. Correspondingly, the concerned papers were submitted and will be soon published in well-known journal papers. Our review opinion on the comment is as follows. Dr Chen largely pointed out the four problems from our paper. (1) *Spurious eigensolutions*: it is correct that the spurious eigensolutions are produced when the method using the non-dimensional dynamic influence function has been extended to the Neumann problems. But in paper [1], the subject of analysis of interest was limited within membranes, for which the Neumann boundary condition is generally meaningless. In addition, how we settle this spurious problem in acoustic cavities with the Neumann boundary will be addressed in a paper to be published soon. (2) *Ill-conditioned behavior*: it is apparent that the NDIF method yields the ill-conditioned behavior when the boundary nodes are increased to obtain higher order modes. Note, however, that this problem is produced in the low-frequency range where lower order modes exist, not in the high-frequency range. The reason is that too excessive boundary nodes have been used to obtain lower order modes. Concretely speaking, in such a case when too many nodes are used, the ill-conditioned behavior is observed in only the low-frequency range and is out of the question because the converged eigenvalues for lower order modes are obtained when decreasing the number of nodes. (3) *Multiplicity*: The singular-value decomposition method has already been used in our past works (but the results were omitted in paper [1]). In this case the capability of search of eigenvalues was not good in the low-frequency range in comparison with the determinant searching method

employed in paper [1], when many nodes were used for higher order modes. Thus, the latter method was used in paper [1] although the ill-conditioned behavior could be overcome by means of the former. (4) *Limitation* (*multi-connected domain*): the NDIF method could not be applied to not only membranes with multi-connected region but also to highly concave membranes. The reason may be simply explained with an annular membrane, for which the two closed regions of the outer annular and inner circular regions are created when boundary nodes are distributed along the boundary of the membrane. It may be consequently said that the NDIF method yields the mixed eigenvalues for the two regions. In order to overcome these shortcomings, a modified NDIF method of subdividing a multi-connected or highly concave region is required. In a paper published soon, good results were obtained using the modified NDIF method in which the compatibility conditions (continuity in displacement and slope) were considered between subdomains.