ASI3D8

This command is used to construct an eight-node zero-thickness3D brick acoustic-structure interface element object based on a bilinear isoparametric formulation. The nodes in the acoustic domain share the same coordinates with the nodes in the solid domain.

elementASI3D8 $eleTag $node1 $node2 $node3 $node4 $node5 $node6 $node7 $node8

$eleTag	unique element object tag
$node1 - $node4	four nodes defining structure domain of element boundaries (numbered as shown in the figure below)
$node5 - $node8	four nodes defining acoustic domain of element boundaries (numbered as shown in the figure below)

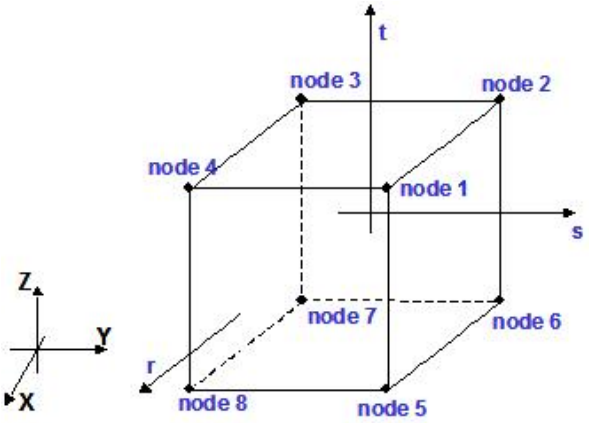

Figure 1.1 Numbering of nodes for the B-bar brick element

Formulation

At the acoustic-structure interface, the boundary condition is written as

$$u_n^f = u_n^s \tag{1}$$

where u_n^f and u_n^s are the normal displacement of acoustic domain and structure domain, respectively. The discretized finite element equation is written as

$$\begin{bmatrix} 0 & 0 \\ -[Q]^T & 0 \end{bmatrix} \begin{Bmatrix} \ddot{u} \\ \ddot{p} \end{Bmatrix} + \begin{bmatrix} 0 & [Q] \\ 0 & 0 \end{bmatrix} \begin{Bmatrix} u \\ p \end{Bmatrix} = \begin{Bmatrix} f_s \\ f_f \end{Bmatrix} \tag{2}$$

where u and p are the displacement of structure domain and pressure of acoustic domain, respectively. The matrix [Q] is defined as

$$[Q] = \int_S [N^s]^T n^- [N^f] dS \tag{3}$$

where $[N^s]$ and $[N^f]$ are the shape function of structure domain and pressure of acoustic domain, respectively, n is the outward normal to the surface of structure domain.

Reference

1. ABAQUS theory manual.(2.9.1 Coupled acoustic-structural medium analysis)
2. Y. Gao, Q. Gu, Z. Qiu, Sensitivity Analysis for Seismic Responses of Coupled Dam-Reservoir-Foundation Systems, ASCE Journal of Engineering Mechanics, under preparation.