National Institute of Technology Rourkela

Departmental Seminar

Seminar Title	: ACOUSTIC BACKSCATTERING FROM A SPHERE BY MINIMIZING A WEAK FORM OF THE BOUNDARY CONDITION
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Venue	: CAD LAB
Date and Time	: 29 Jul 2024 (11:00)
Abstract	: An analytical method is presented to determine the acoustic field when a plane wave is incident on a rigid sphere. The outgoing scattered pressure is the weighted sum of an infinite number of terms where each term is a solution to the Helmholtz wave equation and includes a product of a Legendre polynomial and a spherical Hankel function. The series solution is well-known, but a new method is used to determine the weights or coefficients. The total velocity is the sum of the incident and scattered velocities. The strong boundary condition is zero total velocity along the normal to the sphere everywhere on the sphere. It is replaced by a weak boundary condition: the integral of the square of the velocity over the surface of the sphere is minimized with respect to the coefficients. This is done by equating the derivative of the integral with respect to the coefficients to zero and solving the resulting equations. The method yields exactly the same coefficients obtained by using the strong boundary condition. Therefore, the numerical results are the same. Numerical results are presented at the non-dimensional frequencies ka = 5 and 25 where k is the acoustic wavenumber and a is the radius of the sphere. The method is easily extended to scattering from bodies of other shapes.