1. Introduction
The Scalar-field approach of IE-MEI (SIE-MEI) method has been successfully implemented to smooth\shape\three-dimensional (3D) acoustic scattering problems [1], [2]. The basic idea of this method stands on Integral Equation formulation of MEI (IE-MEI) method [3], where the localized boundary integral equation is applied on the object surface which satisfies the MEI postulates [4] and is discretized in sparse linear equations. The original IE-MEI method was developed for electromagnetic (EM) scattering problem which is suitable for two-dimensional (2D) boundaries. In this paper, the implementation and the results of SIE-MEI method for more general shape, e.g. cube, are presented.

2. Theory of SIE-MEI method
Let us consider a scalar field problem and separate it into two problems within the same domain. These two problems can be represented by the 3D scalar Helmholtz equations and satisfy the scalar reciprocity relation. Let us consider an imaginary surface near the scatterer as of Hirose’s approach [6] and apply the scalar reciprocity relation on it. With appropriate limiting condition this leads to the localized boundary integral equation which satisfies the MEI postulates [4]. Discretizing this integral equation repeatedly for the whole scatterer surface, two sparse matrices of local sources which are invariant to excitation are obtained for any arbitrary shape body of acoustic problem is presented. The application of SIE-MEI method on 3D arbitrary shape body of acoustic problem is presented. The agreement of numerical solution with CfBEM exhibits the validity of SIE-MEI method on 3D arbitrary shape body of acoustic problem, with keeping the matrix sparsity. We are ongoing the research to implement this method to any arbitrary shape body to validate our comments.

3. Scattering from a Cube
As an example of non-smooth shape, a cube is choosen in this paper. A plane wave is incident from $+$z direction as in Fig.1(a). The system of spherical wave functions is taken as a metron set

$$\rho(r, \theta, \varphi) = \sum_{n=0}^{\infty} h_n^{(2)}(kr) \sum_{m=-n}^{n} p_n^m(\cos \theta)e^{jm\varphi}. \quad (2)$$

Figure 1(b) shows the 2D plot of equivalent surface source on the cube (10 segments per wavelength).

4. Conclusion
The application of SIE-MEI method on 3D arbitrary shape body of acoustic problem is presented. The agreement of numerical solution with CfBEM exhibits the validity of SIE-MEI method on 3D arbitrary shape acoustic body, with keeping the matrix sparsity. We are ongoing the research to implement this method to any arbitrary shape body to validate our comments.

References