

**NUMERICAL COMPUTATION OF THE EIGENVALUES
FOR THE SPHEROIDAL WAVE EQUATION WITH
ACCURATE ERROR ESTIMATION BY MATRIX METHOD***

YOSHINORI MIYAZAKI[†], NOBUYOSHI ASAI[‡], DONGSHENG CAI[§], AND YASUHIKO IKEBE[¶]

Abstract. A method to compute the eigenvalues of the spheroidal wave equations is proposed, as an application of a theorem on eigenvalues of certain classes of infinite matrices. The computation of its inverse problem (namely, solving another parameter c^2 for given eigenvalue λ) is likewise given. As a result, precise and explicit error estimates are obtained for the approximated eigenvalues.

Key words. spheroidal wave equation, eigenvalue, numerical computation, error estimate, infinite symmetric tridiagonal matrix

AMS subject classifications. 34L16

*Received January 4, 2006. Accepted for publication March 9, 2006. Recommended by F. Stenger.

[†]Faculty of Informatics, Shizuoka University, Johoku 3-5-1, Hamamatsu, Shizuoka, 432-8011, Japan (yoshi@inf.shizuoka.ac.jp).

[‡]Department of Computer Software, The University of Aizu, Tsuruga, Ikkimachi, Aizuwakamatsu, Fukushima, 965-8580, Japan (nasai@u-aizu.ac.jp).

[§]Institute of Information Sciences and Electronics, The University of Tsukuba, Tennodai 1-1-1, Tsukuba, Ibaraki, 305-8573, Japan (cai@is.tsukuba.ac.jp).

[¶]Shimo-hirooka 702-16, Tsukuba, Ibaraki, 305-0042, Japan (ikebe@ibaraki.email.ne.jp).