

The 50 years of Herrera's orthogonality relation and beyond (a review)

by

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Abstract

Fifty years after the publication of Herrera's (1964) orthogonality relation it seems convenient to review the subject. This paper is frequently quoted up to the recent past in the year 2014. We present a historical overview about the scientific context of orthogonality relations in the framework of eigenvalue problems (especially Sturm-Liouville problems) in order to point out the importance for guided waves and surface waves, which lies mainly in the fact that the orthogonality relations provide-formally at least-the possibility of expanding a more or less arbitrary function in a series of the orthogonal functions. Such a situation occurs *e.g.* in a waveguide with discontinuities. We underline the great generality of Herrera's approach and the connection to the theory of biorthogonality. Specific features of the applicability of orthogonality relations for seismic surface waves are presented together with an outlook on yet unsolved problems and future work.