

ONE-WAY VERSIONS OF THE KIRCHHOFF INTEGRAL FOR ACOUSTIC DATA
(2-23)

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The conventional Kirchhoff integral is based on the two-way wave equation and formulates how the acoustic pressure at a point A inside a closed surface S can be calculated when the acoustic wavefield is known on S . In its general form the integrand consists of two terms: one term containing the gradient of a Green's function and the acoustic pressure; the other term containing a Green's function and the gradient of the acoustic pressure. When surface S is planar, the integrand can be simplified by choosing two-way Green's functions, such that either the first term or the second term vanishes on S . The conventional approach to deriving Rayleigh-type integrals has practical value only for media with small contrasts so that the two-way Green's functions do not contain significant multiple reflections. We present a modified approach for simplifying the integrand of the Kirchhoff integral by choosing one-way Green's functions such that the first term of the integrand becomes identical to the second term. The resulting Rayleigh-type integrals are the theoretical basis for true amplitude one-way wavefield extrapolation techniques in inhomogeneous media with significant contrasts. Finally we present a matrix representation of the one-way Rayleigh-type integrals. This matrix representation is useful when discussing numerical schemes.

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50th annual EAEG meeting, The Hague