Courtesy of CRC Press/Taylor & Francis Group

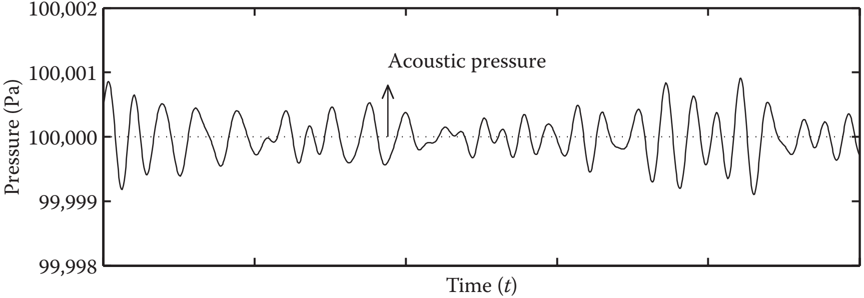

Figure 2.1 Illustration of pressure fluctuations relative to atmospheric pressure.

002x001.eps

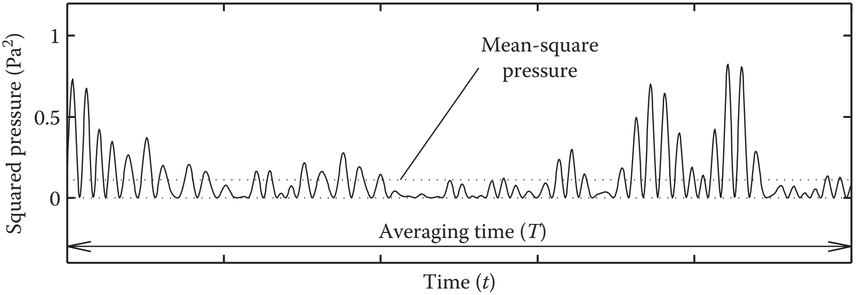

Figure 2.2 Squared acoustic pressure from Figure 2.1 and corresponding mean-square value.

002x002.eps

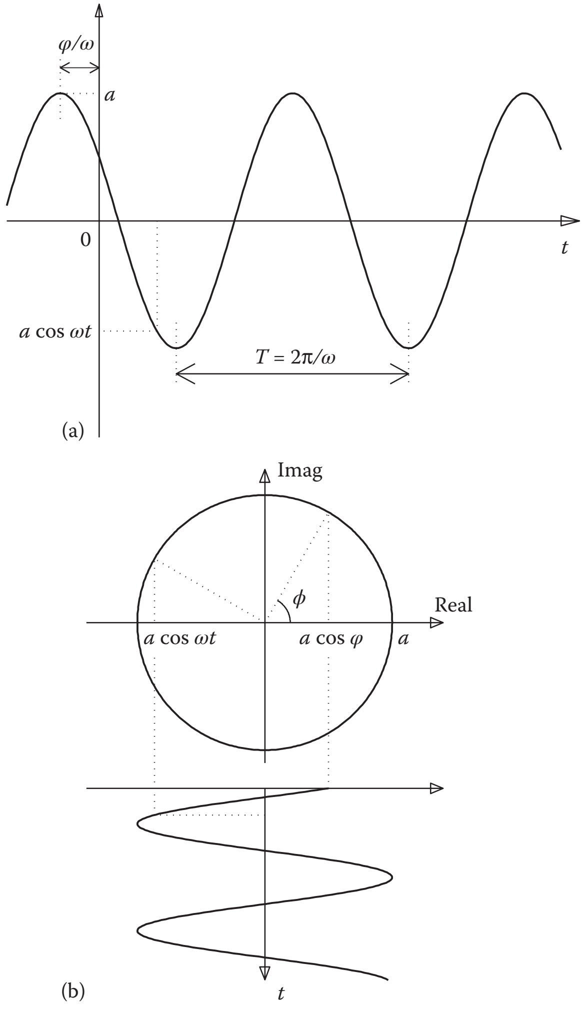

Figure 2.3 (a) Harmonic motion at circular frequency ω; (b) harmonic motion seen as a projection of circular motion.

002x003.eps

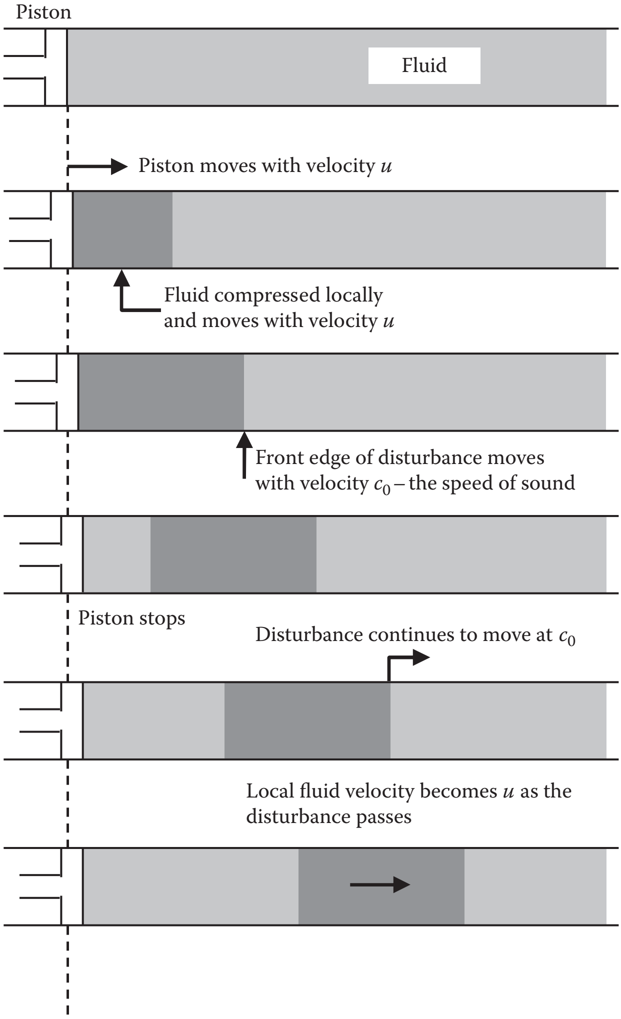

Figure 2.4 Illustration of the propagation of a sound pulse in a semi-infinite tube. The shaded area denotes a region of increased pressure in the tube. (Reprinted from Nelson, P.A. and Elliott, S.J., *Active Control of Sound*, chapter 1, Academic Press, London, 1992. With permission.)

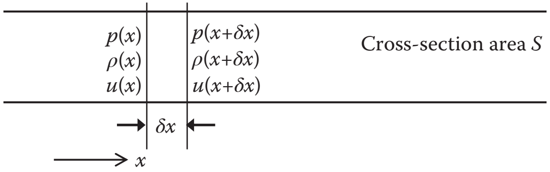

Figure 2.5 Tube of cross-sectional area S with a control volume of length δx. The acoustic variables are given by p, ρ, u at the position x.

002x005.eps

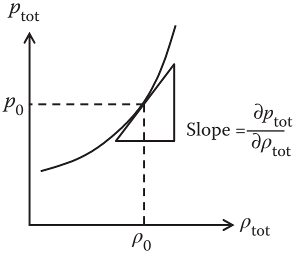

Figure 2.6 General form of the relationship between total instantaneous pressure and density.

002x006.eps

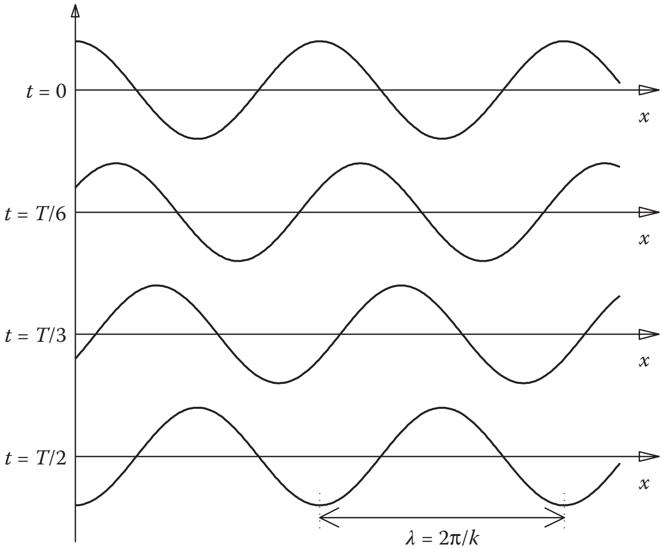

Figure 2.7 Propagation of a harmonic disturbance as a one-dimensional wave.

002x007.eps

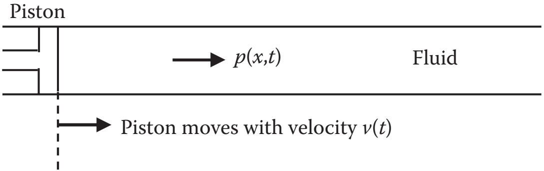

Figure 2.8 Excitation of plane waves in a semi-infinite tube by a vibrating piston.

002x008.eps

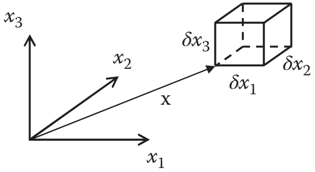

Figure 2.9 Small control volume used to derive the three-dimensional linearised continuity equation.

002x009.eps

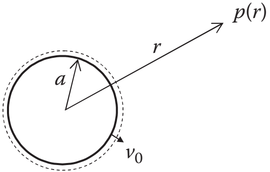

Figure 2.10 Pulsating sphere of radius a.

002x010.eps

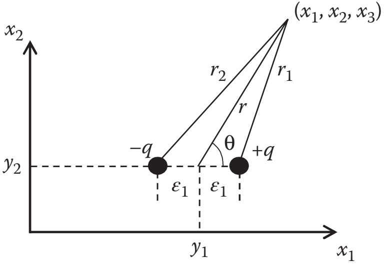

Figure 2.11 Geometrical arrangement of two sources of equal and opposite strength separated by a distance $d = 2\varepsilon_1$, centred at (y_1, y_2, y_3). The x_3 axis is suppressed for clarity.

002x011.eps

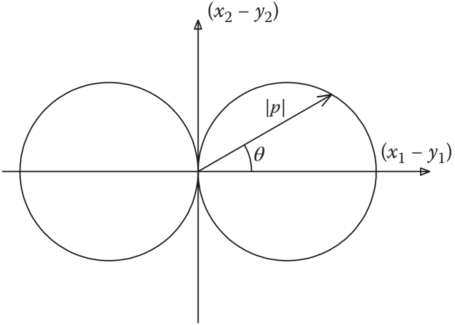

Figure 2.12 Directivity of a dipole showing the angular variation of the far-field pressure amplitude. The x_3 axis is suppressed for clarity. The directivity is axisymmetric about the x_1–y_1 axis.

002x012.eps

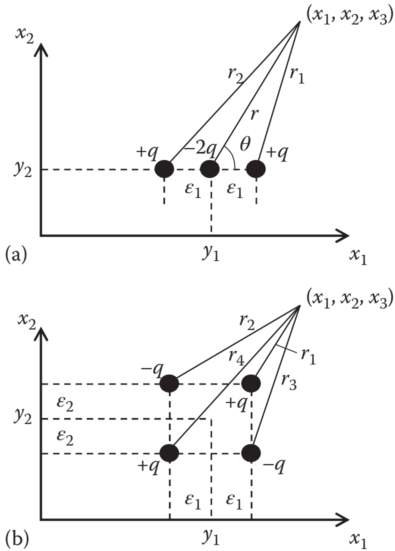

Figure 2.13 Coordinate systems used for the analysis of (a) a longitudinal quadrupole and (b) a lateral quadrupole, centred at (y_1, y_2, y_3). The x_3 axis is suppressed for clarity.

002x013.eps

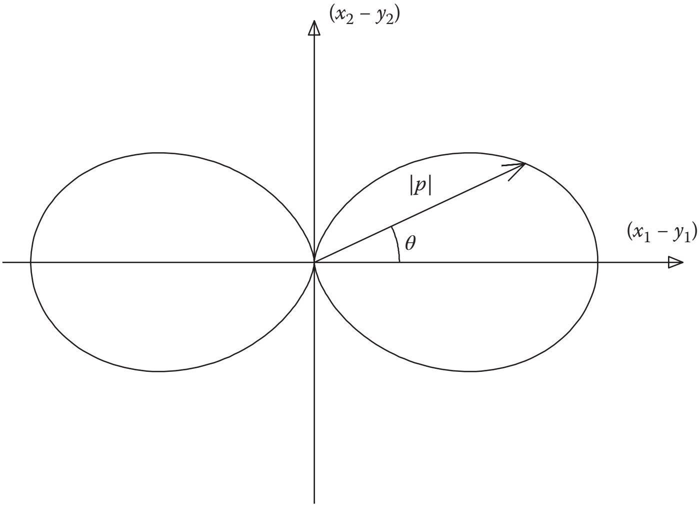

Figure 2.14 Directivity of a longitudinal quadrupole showing the angular variation of the far-field pressure amplitude. The x_3 axis is suppressed for clarity. The directivity is axi-symmetric about the $x_1 - y_1$ axis.

002x014.eps

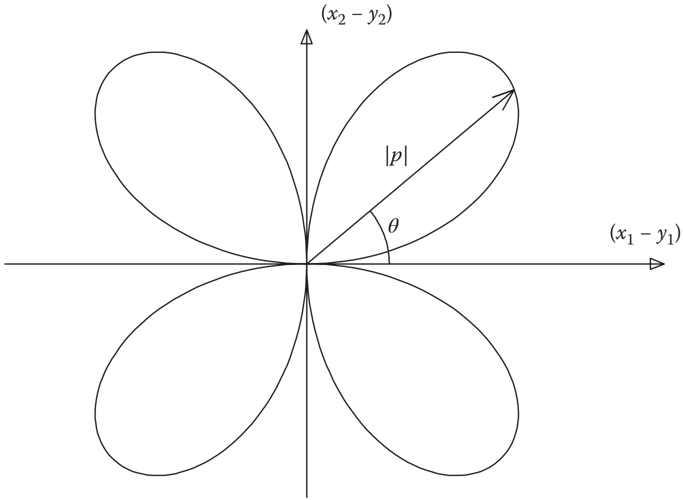

Figure 2.15 Directivity of a lateral quadrupole showing the angular variation of the far-field pressure amplitude. The x_3 axis is suppressed for clarity. The directivity is axisymmetric about the $x_1 - y_1$ axis.

002x015.eps

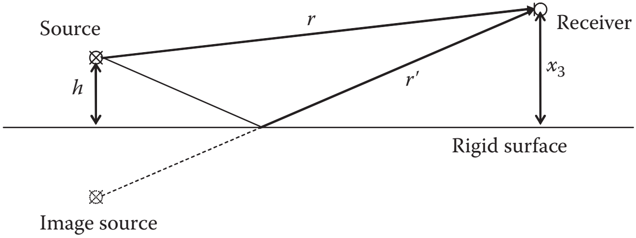

Figure 2.16 Source and its image source in a rigid reflecting plane.

002x016.eps

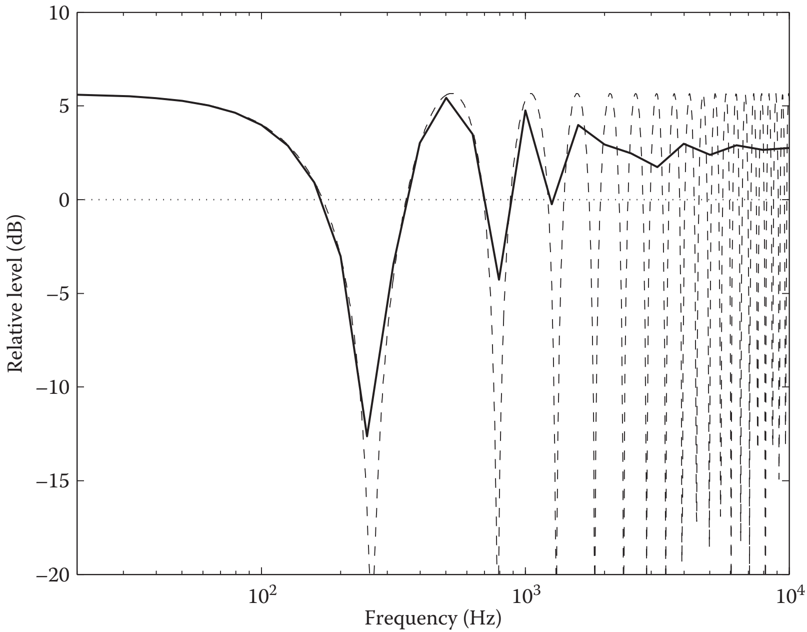

Figure 2.17 Relative sound pressure level due to a source located above a rigid reflecting plane, calculated at narrow frequency spacing (– – –); averaged into one-third octave bands (—).

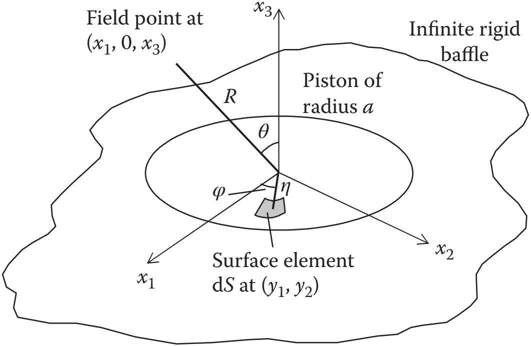

Figure 2.18 Circular piston set in a rigid coplanar baffle.

002x018.eps

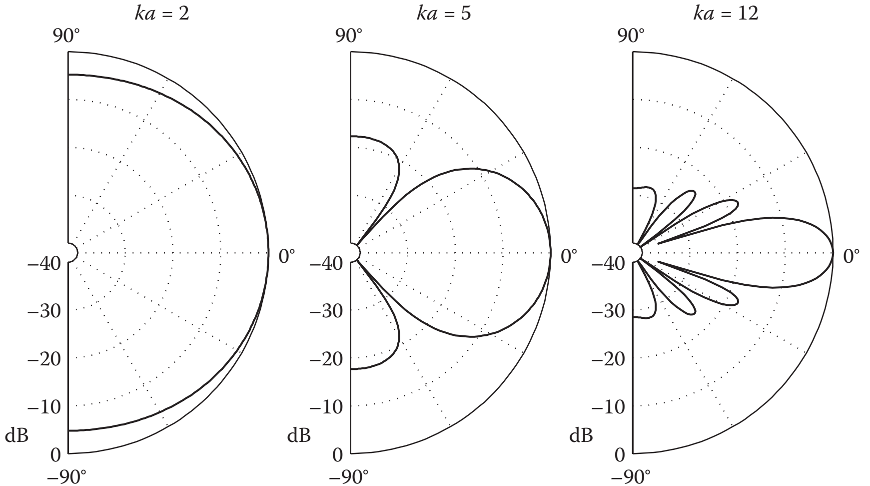

Figure 2.19 Sound pressure level distribution obtained from a circular piston set in a rigid baffle for different values of *ka*, shown relative to the value on the axis.

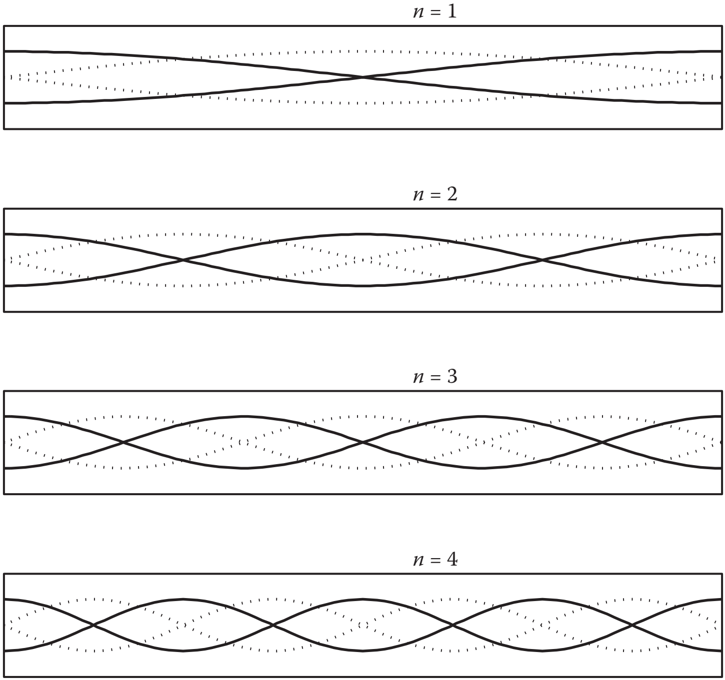

Figure 2.20 Pressure (—) and axial particle velocity (······) mode shapes of a pipe closed at both ends.

002x020.eps

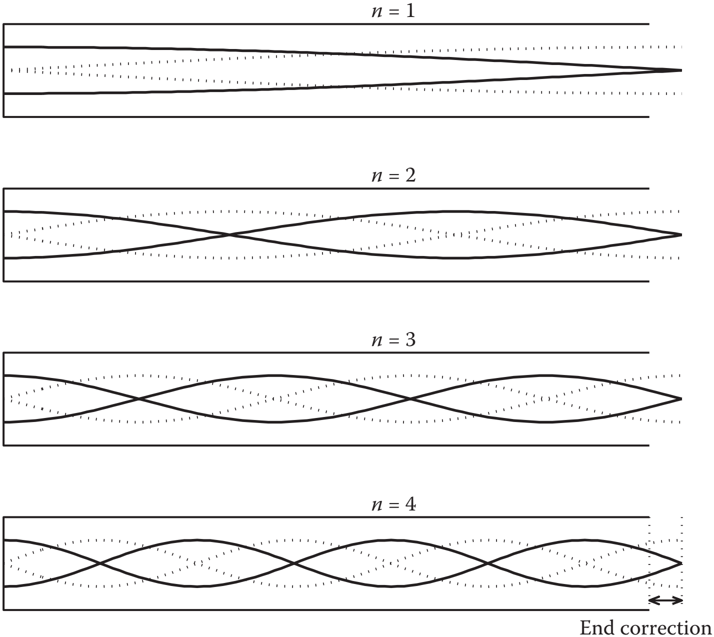

Figure 2.21 Pressure (—) and axial particle velocity (······) mode shapes of an open-closed pipe.

002x021.eps

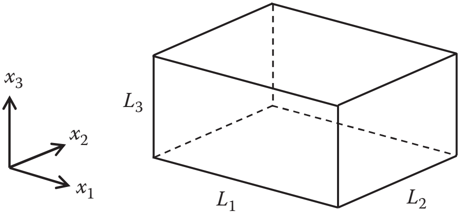

Figure 2.22 Rigid-walled rectangular enclosure.

002x022.eps

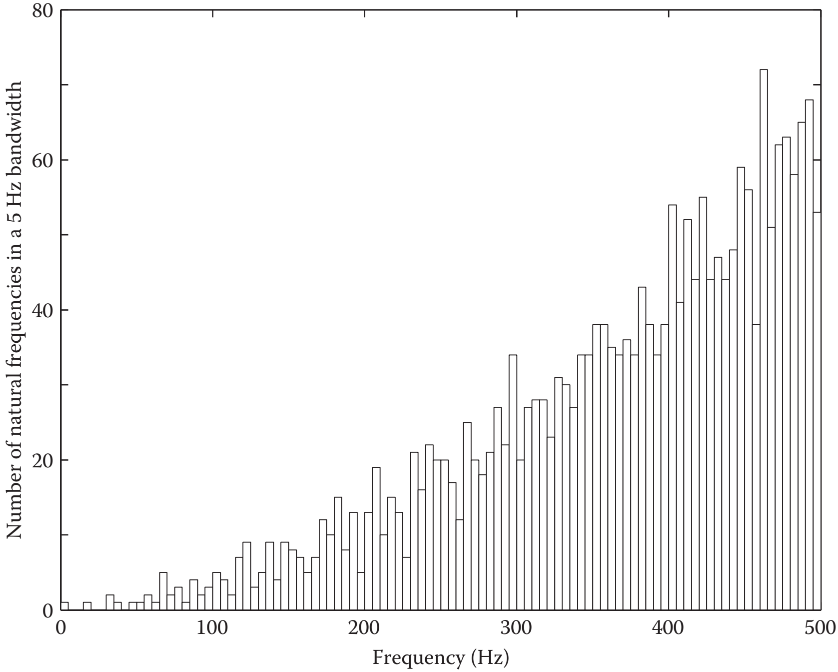

Figure 2.23 Number of natural frequencies in each 5 Hz bandwidth up to 500 Hz for a rectangular enclosure of dimensions 10 m × 5 m × 3 m. (Reprinted from Nelson, P.A. and Elliott, S.J., *Active Control of Sound*, chapter 1, Academic Press, London, 1992. With permission.)

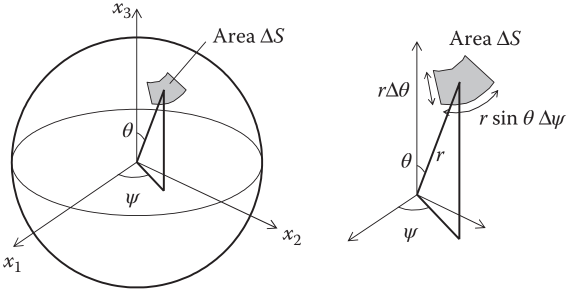

Figure 2.24 Plane-wave construction of a diffuse-sound field model. The surface of the sphere of radius r surrounding a point is divided into N tiny segments of equal area. Each area element has an associated plane wave propagating in a direction defined by the normal to the surface area element. Thus the segment of area ΔS contains $(\Delta SN/4\pi r^2)$ tiny elements.

002x024.eps

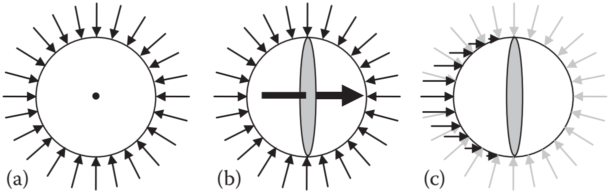

Figure 2.25 Visualisation of the sound intensity at a point in a diffuse field: (a) intensity vectors of plane waves arriving at a point from different directions; (b) the one-sided intensity is that which passes through a surface from one side; (c) components of the intensity vectors of plane waves that contribute to the one-sided intensity.

002x025.eps