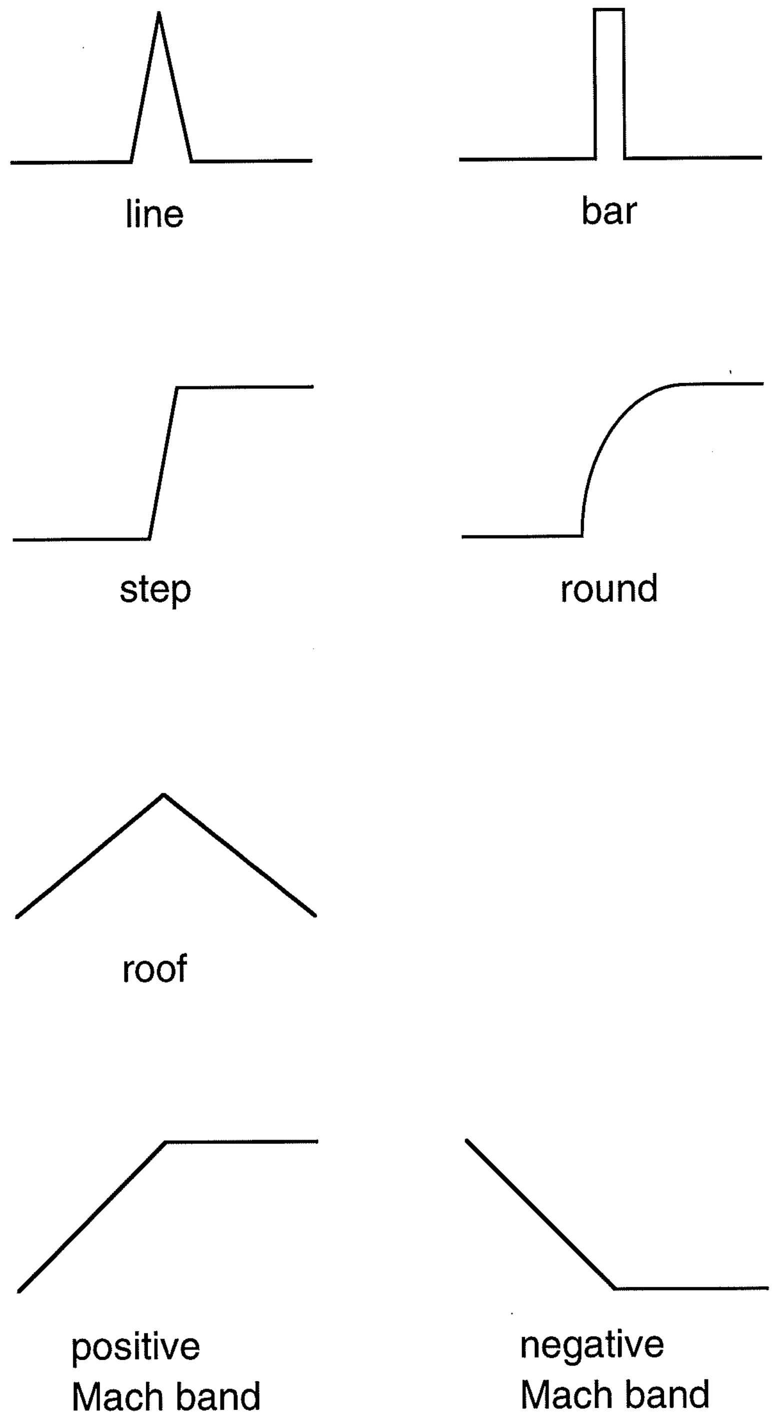

Figure 1. Grey-level profiles (across the normal direction) of seven primary types of edges. Inverted line, bar, and roof are not shown, but can be considered.

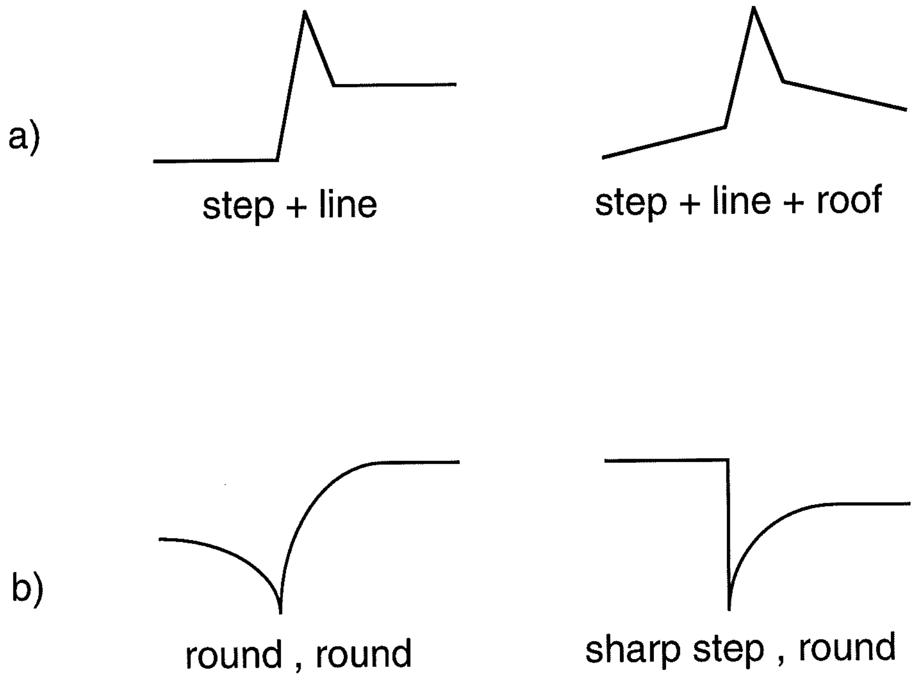

Figure 2. Secondary types of edges can be built by combining edges of primary type in two ways: a) linear superposition; b) succession. We show in both cases the grey-level profiles across the normal direction.

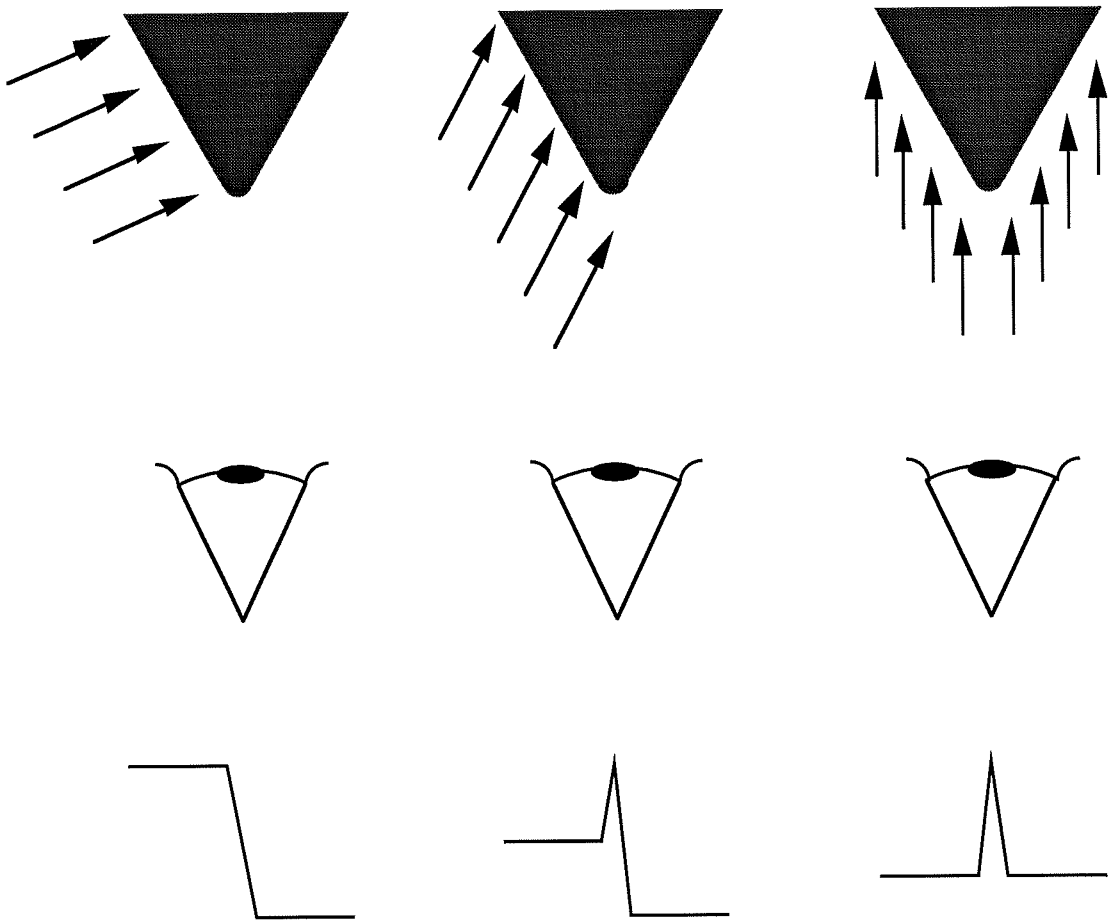

Figure 3. Top: a convex object edge under three illumination conditions; the arrows represent the direction of incoming light. Middle: the observer's viewpoint, shown by an eye (but it can also be a camera). Bottom: the luminance profile corresponding to each of the three illumination conditions; this profile makes a step, step + line, or line edge.

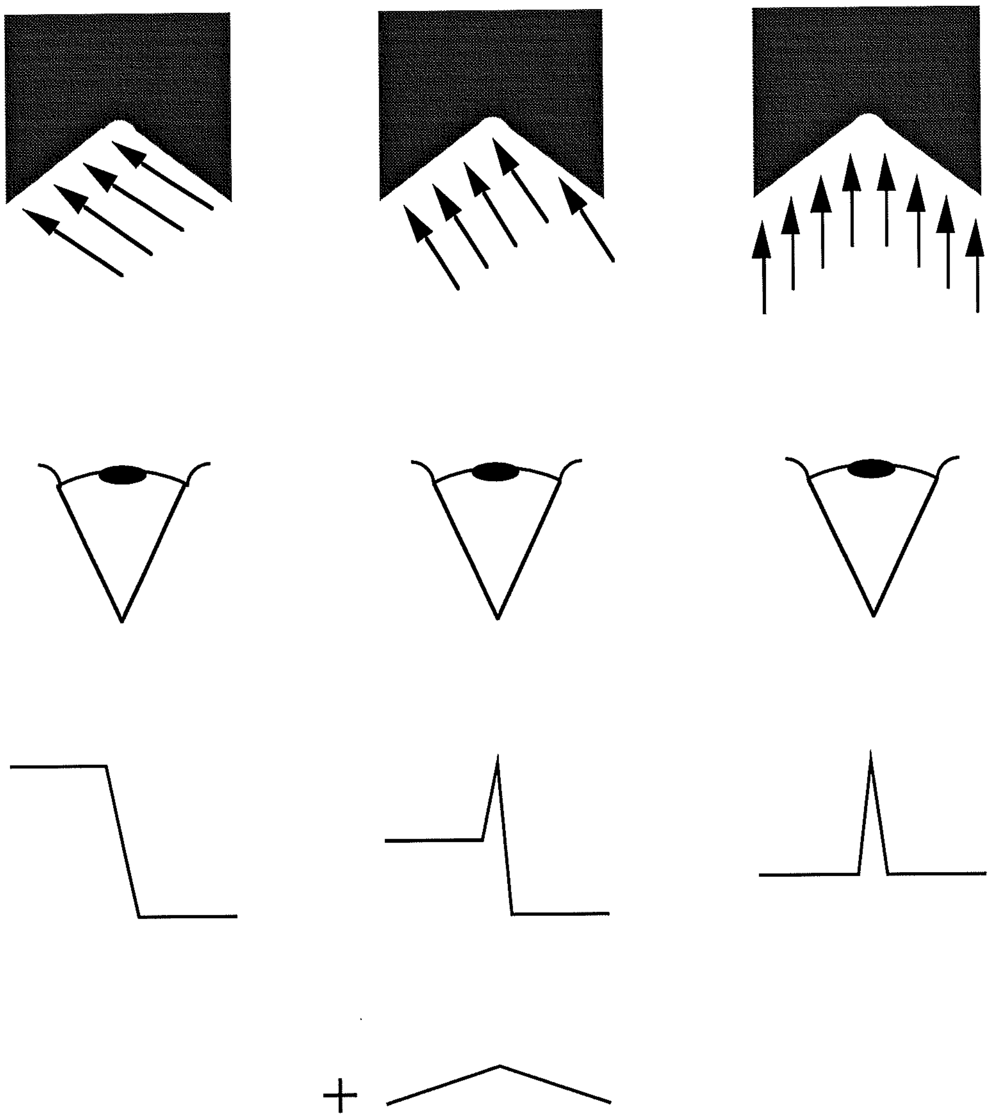

Figure 4. The same as in Figure 3, but now with a concave object edge. Direct reflection of the light gives the same luminance profiles as for a convex object edge, but mutual illumination between the sides produces a roof edge profile, which must be added to the above step, step + line, or line edge profile.

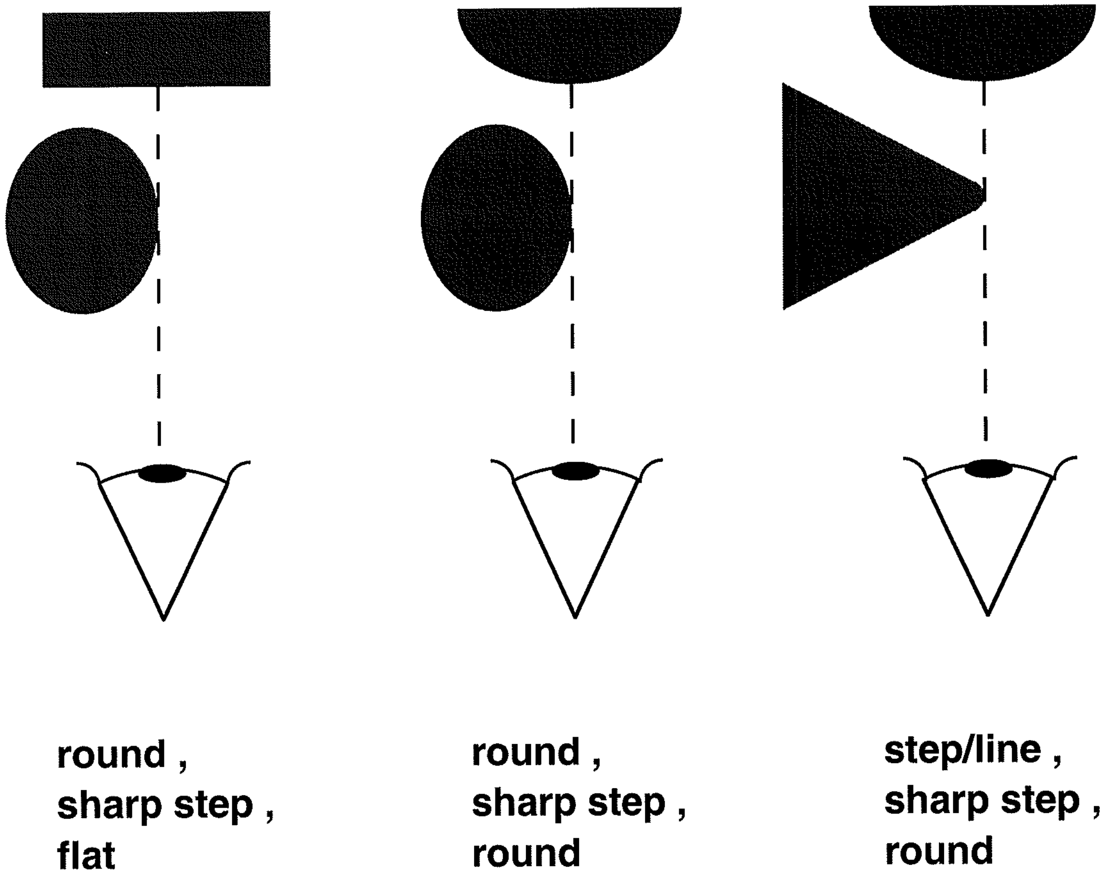

Figure 5. Occlusion in a scene, and its image. The dashed line represents the separation of the visual field between the foreground object on the left and the background object on the right. This sharp separation gives rise to a sharp step in the luminance profile. On the right of this step, if the background object is flat, its image gives a flat luminance profile; if this object is curved, we get a round luminance profile. On the left of this step, if the foreground object is curved, the luminance profile is round, but if this object makes a convex edge, this gives a step, step + line, or line edge profile (as in Figure 3). As noticed by Ling, such compound profiles can lead to round edges, or "valley" edges, as those shown in Figure 2 (b).

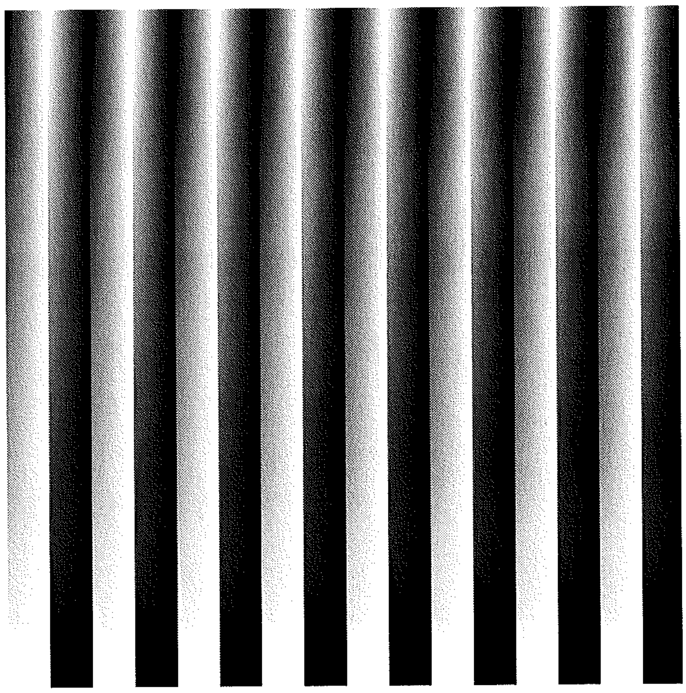

Figure 6. Vertical grating whose horizontal sections are varying from a triangular wave to a square one. In the middle, where both waves are superposed, the edges (combining a step and a roof) are seen slightly to the left of their true location. This is consistent with the phase congruence model for the human perception of edges.

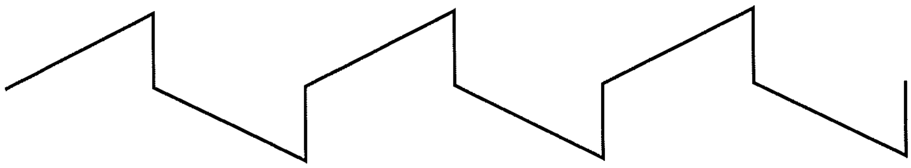

Figure 7. Grey-level profile across a horizontal line in the middle of Figure 3. Both human vision and the phase congruence model localize the compound roof + step edges slightly to the left of their true position.

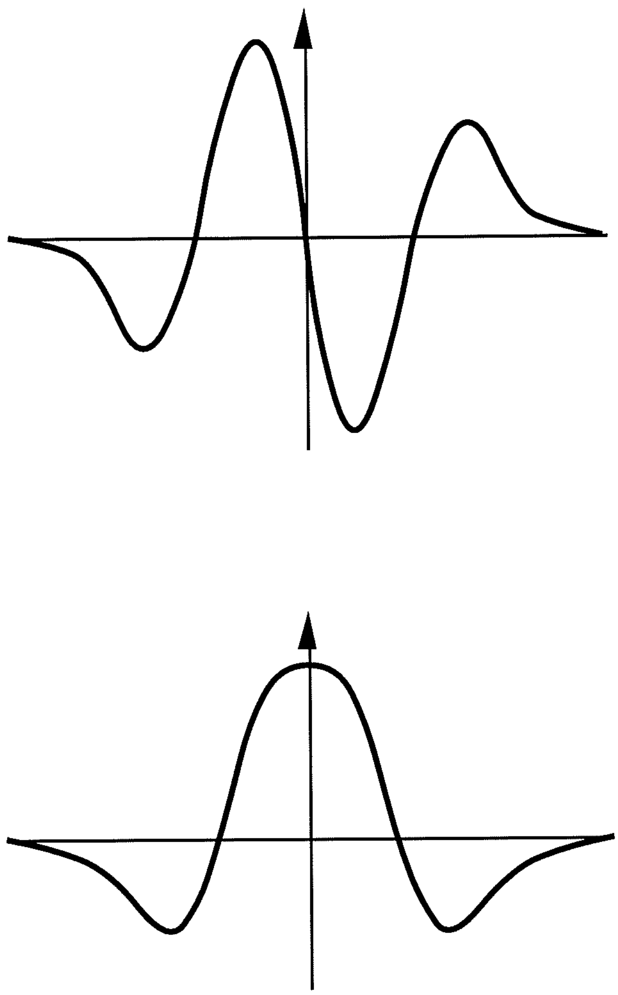

Figure 8. Typical grey-level profiles of the two filters across the normal direction. Top: odd-symmetric filter with constant phase $\pi/2$. Bottom: even-symmetric filter with constant phase 0.

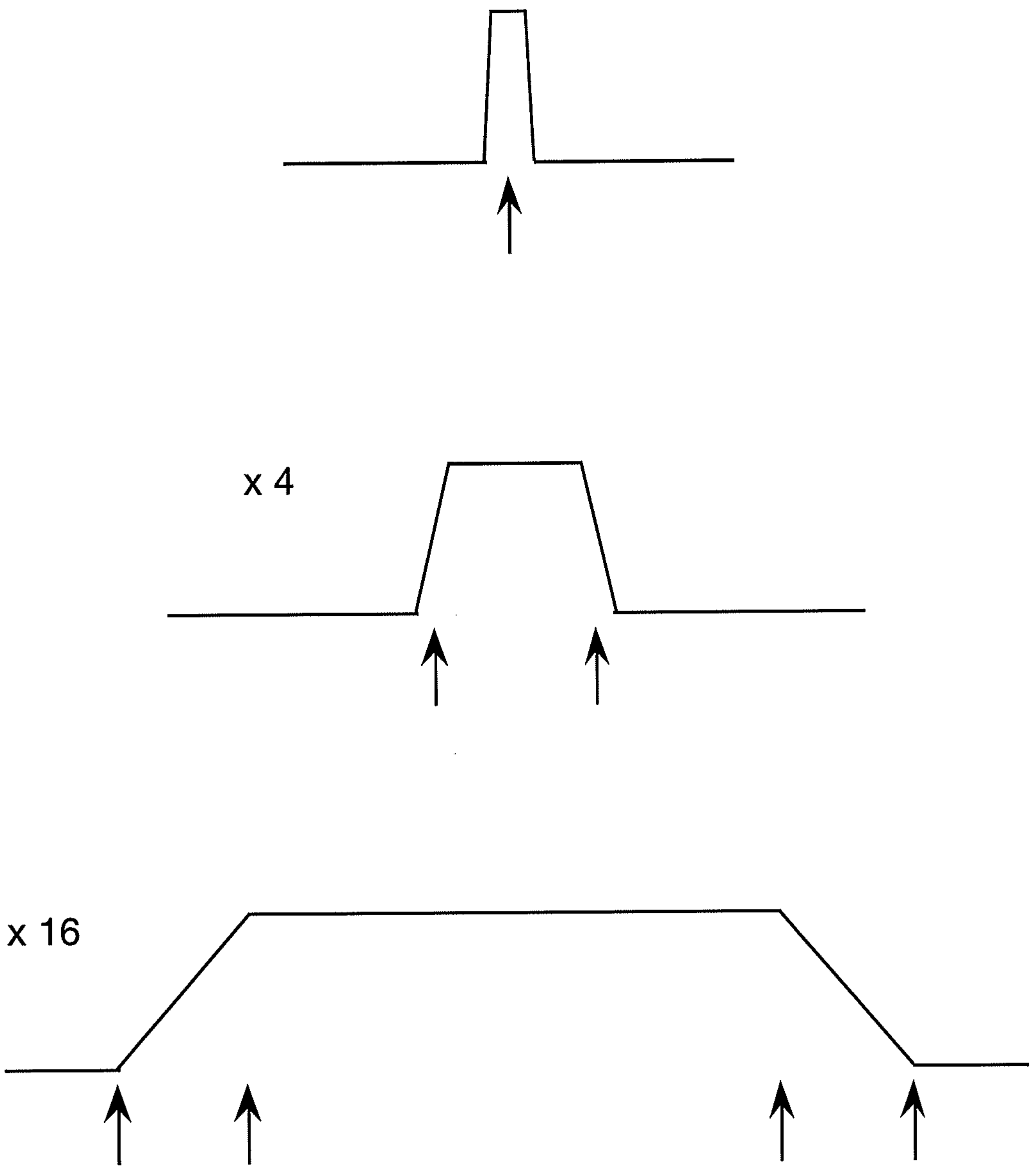

Figure 9. A bar edge profile shown in its original size, then magnified 4 times, and finally 16 times. Arrows indicate the position of edges at each scale.

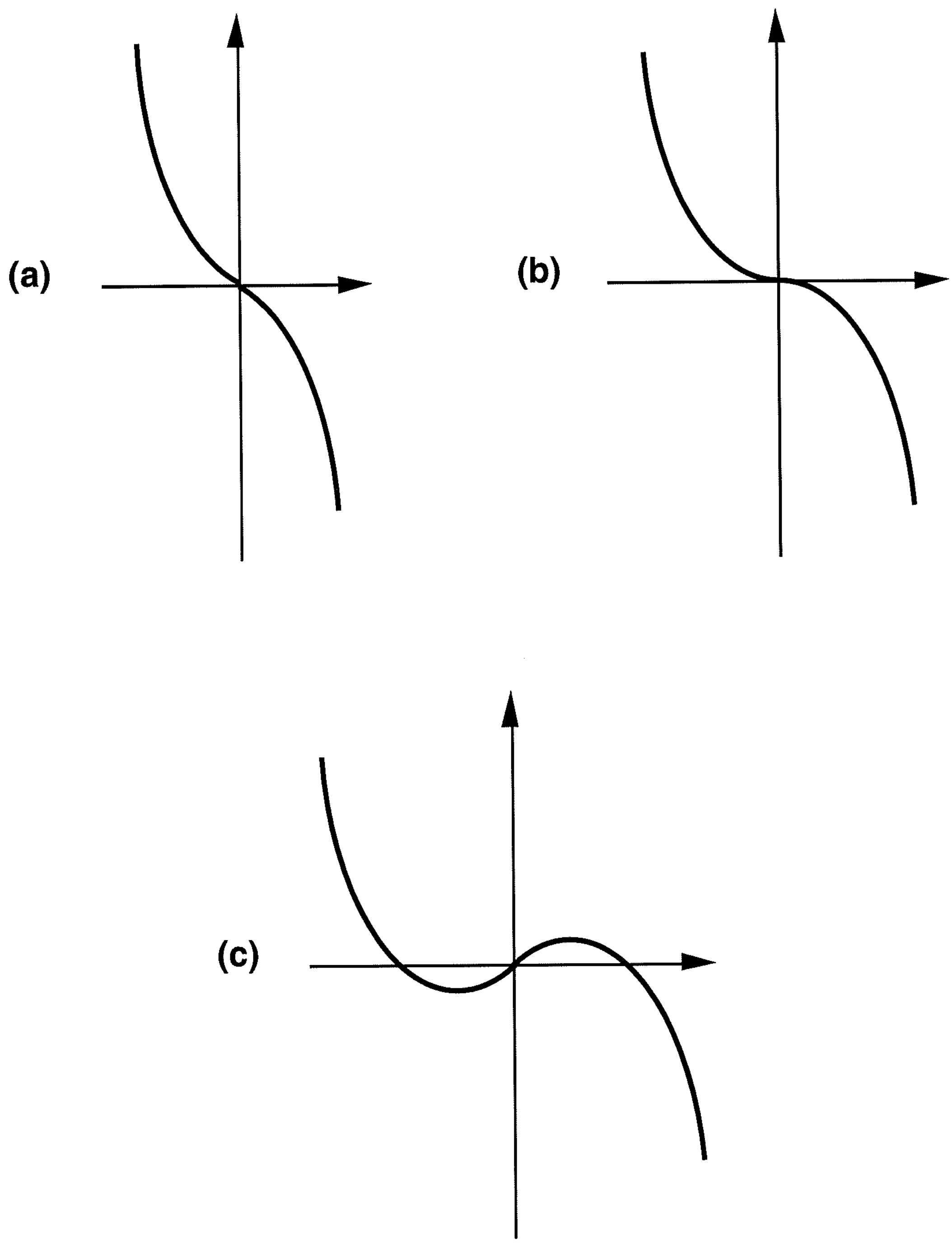

Figure 10. From (a) to (c): as the scale increases, a non-causal local maximum of the energy function is created.

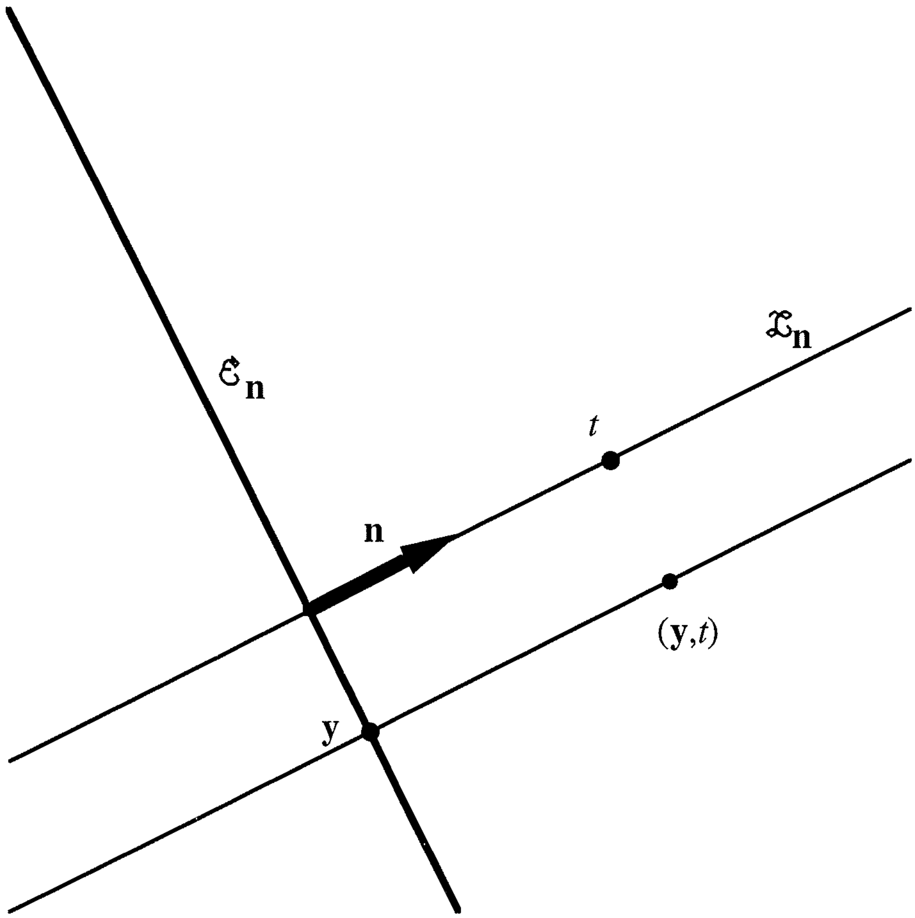

Figure 11. Decomposition of $\mathbf{x} \in \mathfrak{E}$ into $(\mathbf{y},t) \in \mathfrak{E}_{\mathbf{n}} \times \mathbb{R}$.

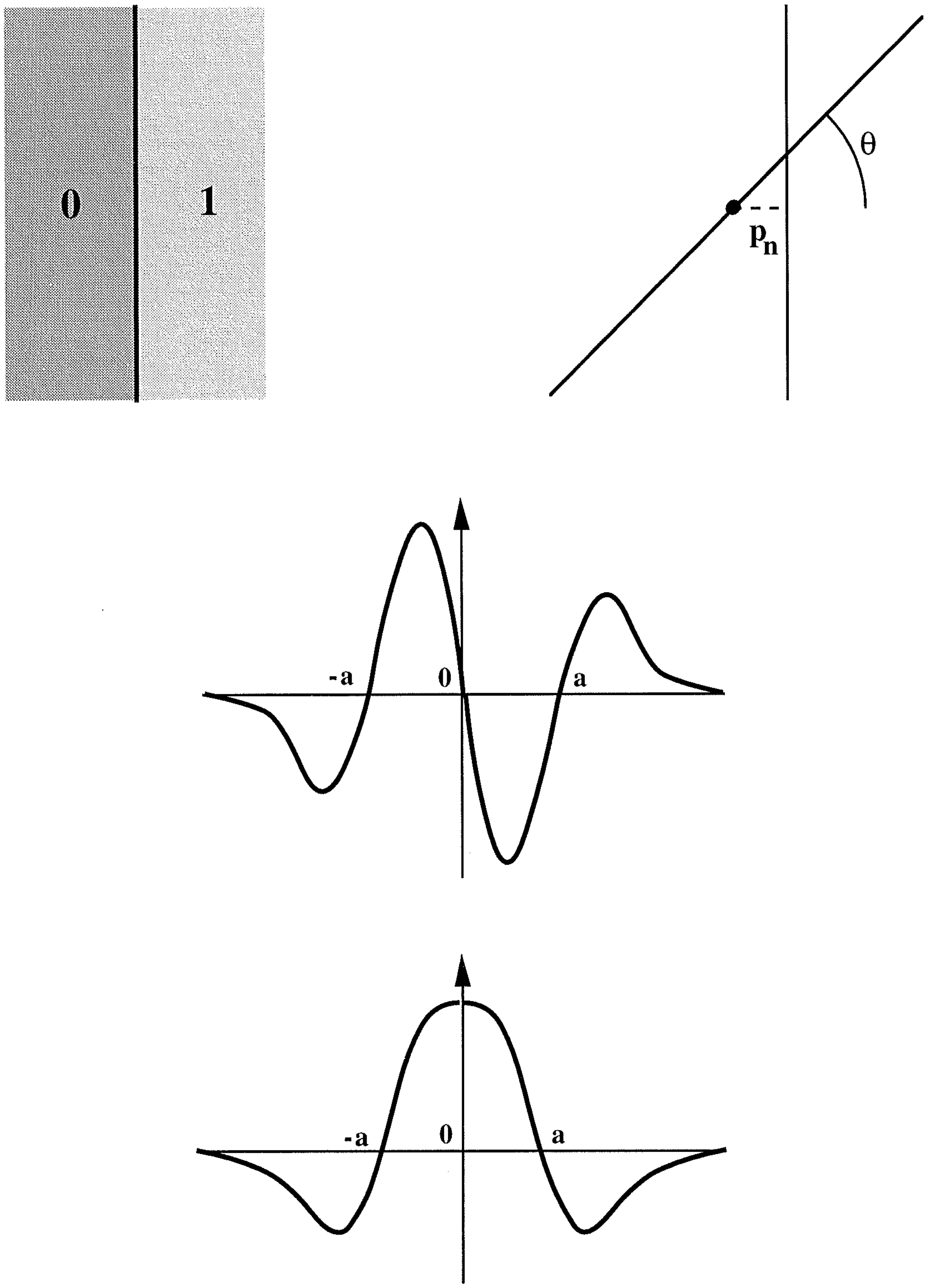

Figure 12. Top left: two-dimensional Heaviside step edge. Top right: geometrical illustration of the convolution of F_θ by the Heaviside step edge, calculated at a point **p** = (p_t, p_n). Below: two possible profiles for the function *f*, one even-symmetric and the other odd-symmetric.

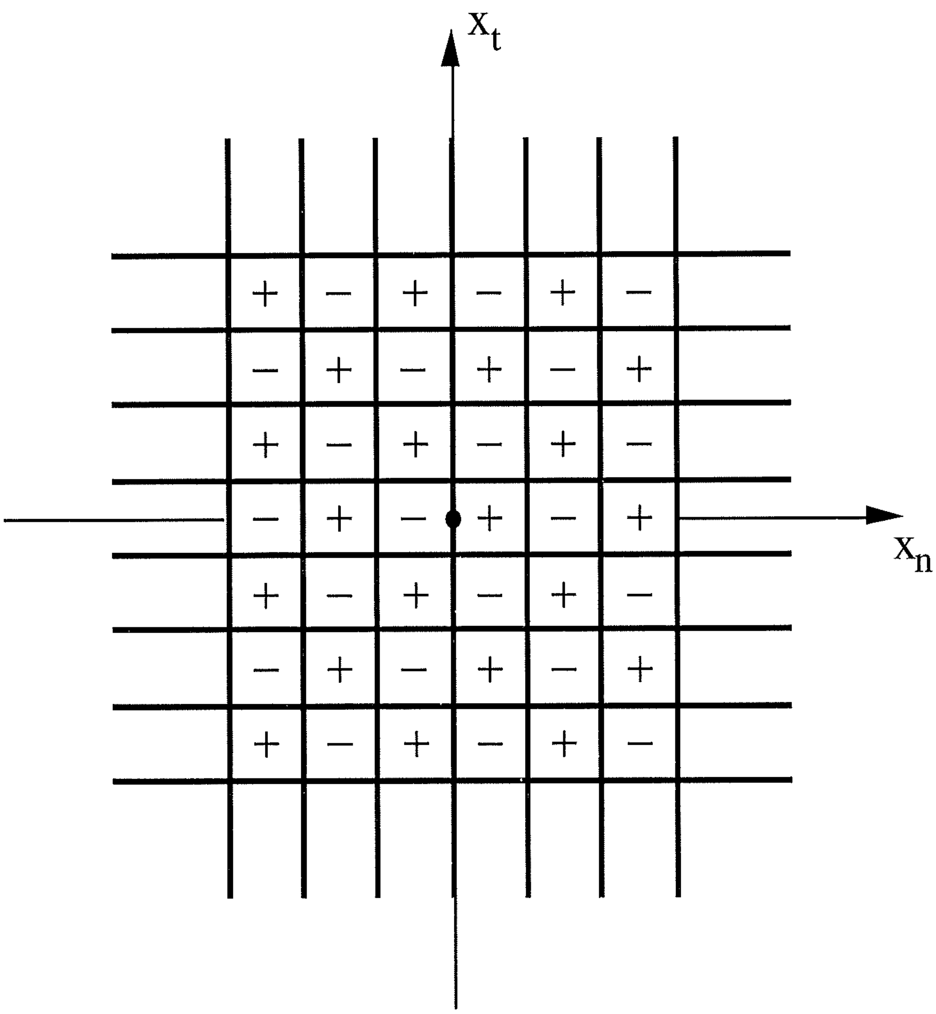

Figure 13. Signs and zero-crossings of the function F (the product of a Gabor sine function in the normal direction and a Gabor cosine function in the tangential direction) given in (4.32).

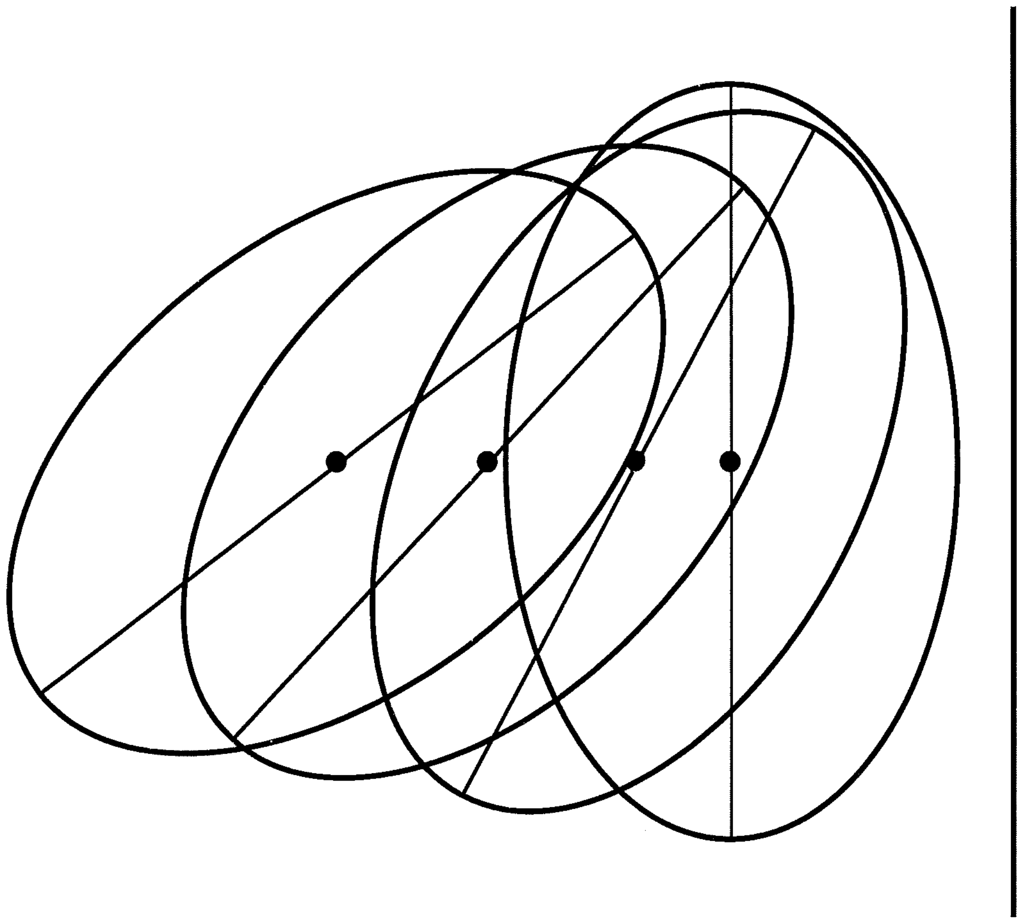

Figure 14. Choose the Gaussian derivative filter given in (4.33) with $\tau = 5$ and $\nu = 3$. The support of the filter is symbolically represented by an ellipse with small axis ν and great axis τ; the latter is shown, it corresponding to the tangential direction, and is the locus of zero-crossings of the filter. Orientation selectivity holds for points at distance $x_n \leq 3.75$ from the true edge position. We show the support of the filter rotated by the angle $\theta[x_n]$ given by (4.35), for which the energy function is highest, for the values x_n = 3.75 ($\theta[x_n] = 0°$), $x_n = 5$ ($\theta[x_n] = 27.88°$), $x_n = 7$ ($\theta[x_n] = 43.40°$), $x_n = 9$ ($\theta[x_n] = 52.62°$).