

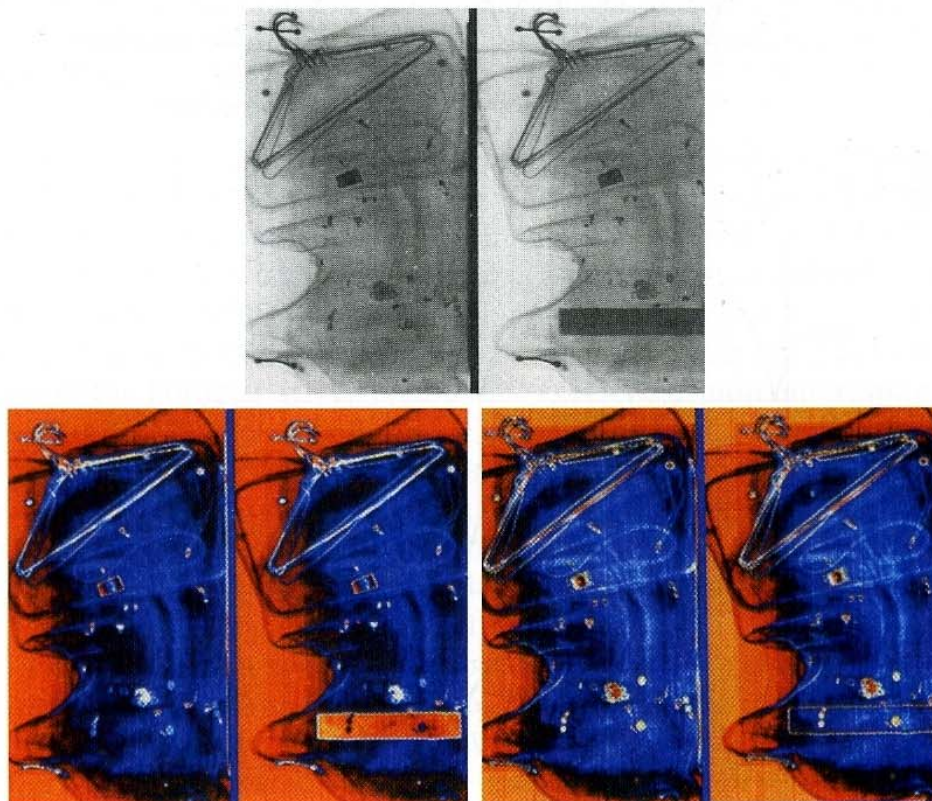
■ Figure 6.24(a) shows two monochrome images of luggage obtained from an airport X-ray scanning system. The image on the left contains ordinary articles. The image on the right contains the same articles, as well as a block of simulated plastic explosives. The purpose of this example is to illustrate the use of gray level to color transformations to obtain various degrees of enhancement.

Figure 6.25 shows the transformation functions used. These sinusoidal functions contain regions of relatively constant value around the peaks as well as regions that change rapidly near the valleys. Changing the phase and frequency of each sinusoid can emphasize (in color) ranges in the gray scale. For instance, if all three transformations have the same phase and frequency, the output image will be monochrome. A small change in the phase between the three transformations produces little change in pixels whose gray levels correspond to peaks in the sinusoids, especially if the sinusoids have broad profiles (low frequencies). Pixels with gray-level values in the steep section of the sinusoids are assigned a much stronger color content as a result of significant differences between the amplitudes of the three sinusoids caused by the phase displacement between them.

The image shown in Fig. 6.24(b) was obtained with the transformation functions in Fig. 6.25(a), which shows the gray-level bands corresponding to the explosive, garment bag, and background, respectively. Note that the explosive and background have quite different gray levels, but they were both coded with

EXAMPLE 6.5:

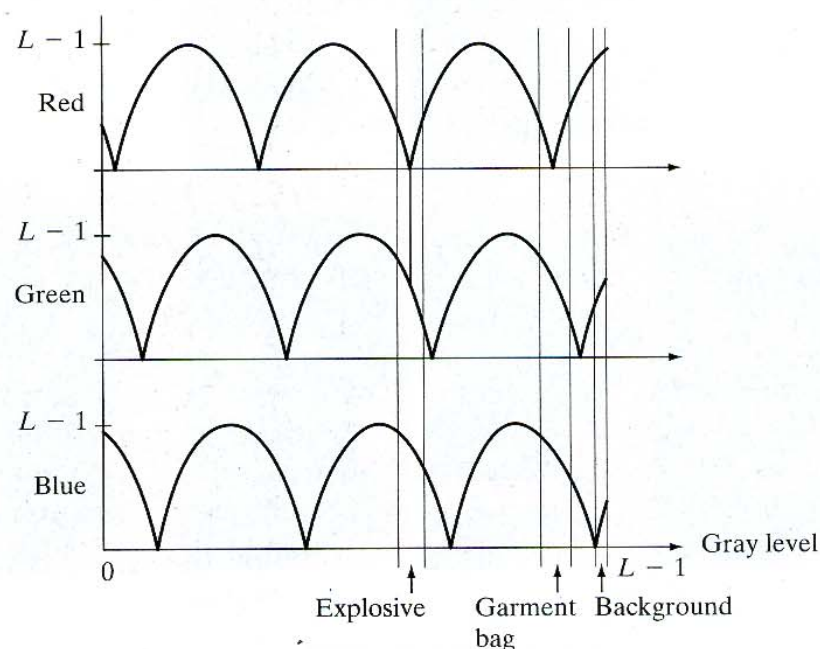
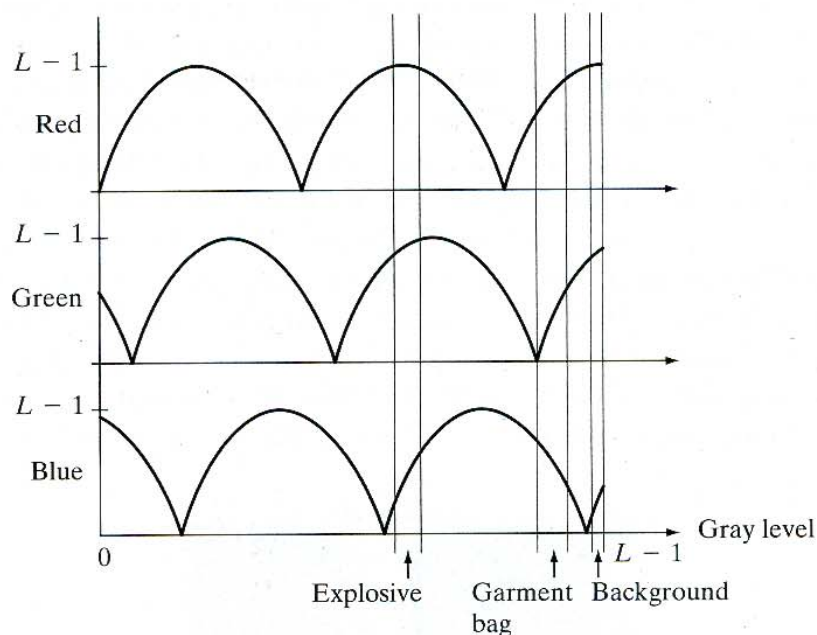
Use of pseudocolor for highlighting explosives contained in luggage.



a
b c

FIGURE 6.24 Pseudocolor enhancement by using the gray-level to color transformations in Fig. 6.25. (Original image courtesy of Dr. Mike Hurwitz, Westinghouse.)

approximately the same color as a result of the periodicity of the sine waves. The image shown in Fig. 6.24(c) was obtained with the transformation functions in Fig. 6.25(b). In this case the explosives and garment bag intensity bands were mapped by similar transformations and thus received essentially the same color assignments. Note that this mapping allows an observer to “see” through the explosives. The background mappings were about the same as those used for Fig. 6.24(b), producing almost identical color assignments. ■



a
b

FIGURE 6.25 Transformation functions used to obtain the images in Fig. 6.24.