figure 7.1. *Schematic explanation of the use of histogram modification to improve image contrast.*

figure 7.2. *Example of contrast enhancement. Note how objects that are not visible on the original image on the left (e.g., the 2nd chair and the objects through the window), are now detectable in the processed one (right).*

figure 7.3. *Original image (top-left) and results of the histogram equalization process with the software package xv (top-right), the proposed image flow for histogram equalization (bottom-left), and the histogram modification flow for a piece-wise linear distribution (bottom-right).*

figure 7.4. *Progress of the histogram equalization flow. The original image is shown on the left, an intermediate step on the middle, and the steady state solution on the right.*

figure 7.5. *Result (right) of simultaneous histogram equalization and anisotropic diffusion for a fingerprint image (left).*

figure 7.6. *Result of the combination of local and global contrast enhancement. The original image is given on the top left. The result of global histogram equalization on the top right, and the one for local contrast enhancement (16×16 neighborhood) on the bottom left. Finally, on the bottom right we show the combination of local and global contrast modification: The image on the left is further processed by the global histogram modification flow.*
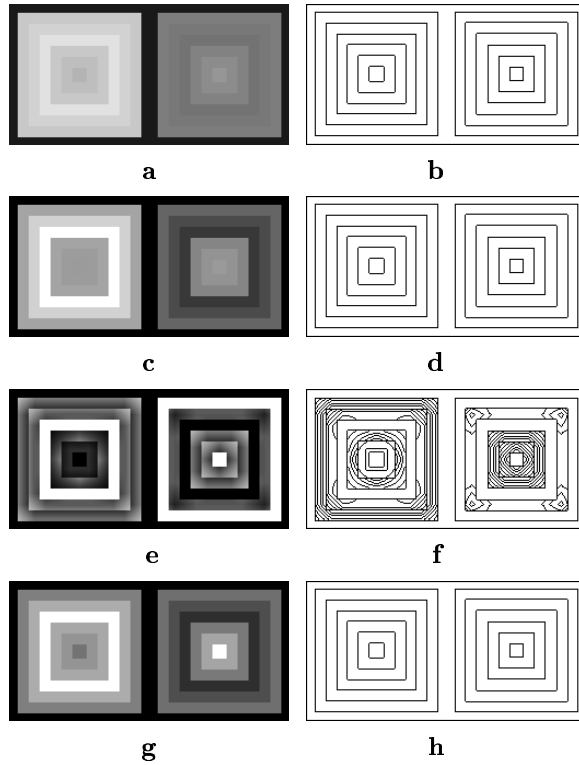
figure 7.7. *Example of the level-sets preservation. The top row shows the original image and its level-sets. The second row shows the result of global histogram modification and the corresponding level-sets. Results of classical local contrast enhancement and its corresponding level-sets are shown in the third row. The last row shows the result of the algorithm. Note how the level-sets are preserved, in contrast with the result on the 3rd row, while the contrast is much better than the global modification.*
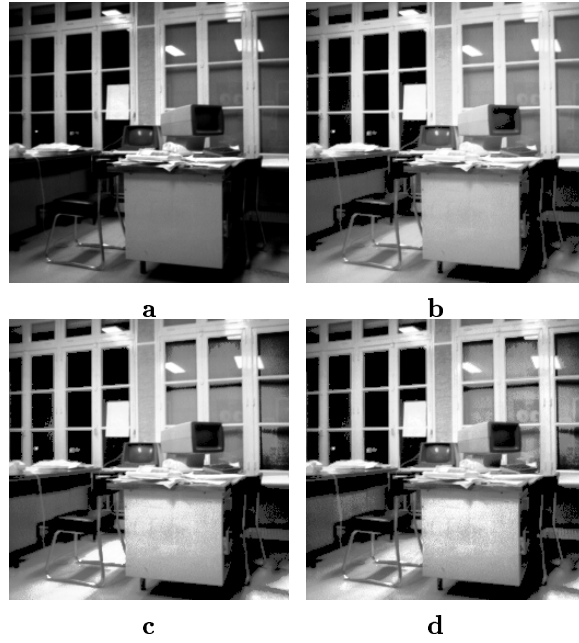
figure 7.8. *Example of shape preserving local histogram modification for real data. The first row shows the original image (a) and the result of global histogram modification (b). An intermediate state (c), together with the steady state of the proposed algorithm (d) are shown in the second row.*
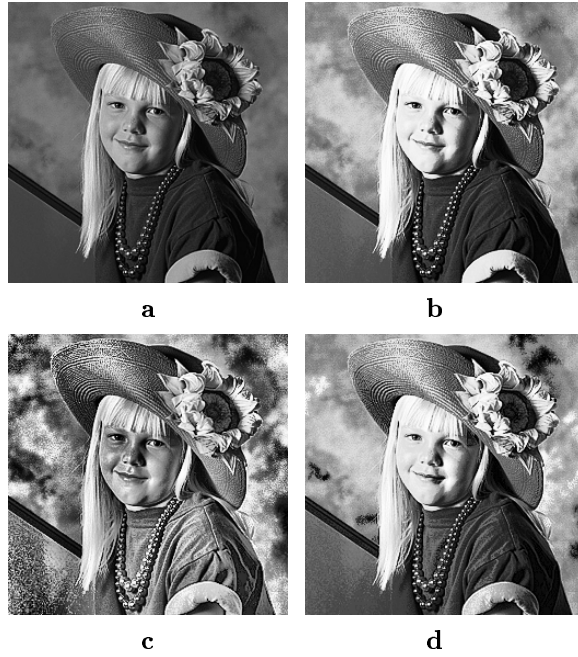
a   b

c   d

figure 7.9. *Additional example of shape preserving local histogram modification for real data. Figure a is the original image. Figures b-d are the results of global histogram equalization, classical local scheme (61 × 61 neighborhood), and shape preserving algorithm, respectively.*

figure 7.10. *Example of local histogram modification of a color image. The original image is shown on the top. The bottom left is the result of applying the shape preserving algorithm to the Y channel in the YIQ color space. On the right, the algorithm is applied again only to the Y channel, but re-scaling the chrominance vector to maintain the same color point on the Maxwell triangle.*
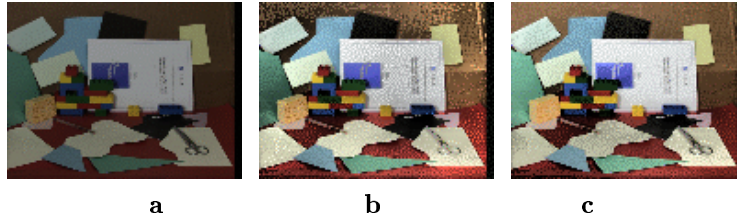
a   b   c

figure 7.11. *Comparison between the classical local histogram modification scheme with the one here described for a color image. Figure 7.11a shows the original image, Figure 7.11b the one obtained with the classical technique, and Figure 7.10c the result of applying the shape preserving scheme. Note the spurious objects introduced by the classical local scheme.*