



(a)



(b)



(c)



(d)

Fig. 3.1 Corners detected by Algorithm 3.1 using (a) $\sigma = 1.5$ pixels and (b) $\sigma = 2$ pixels. (c) Corners that are common in both (a) and (b). (d) Stable corners that persist from $\sigma_1 = 1.5$ pixels to $\sigma_2 = 3$ pixels. Since the position of a corner may shift as the resolution is changed, in this figure, corners whose positions did not shift by more than $\Delta\sigma = \sigma_2 - \sigma_1$ pixels were considered stable and selected.

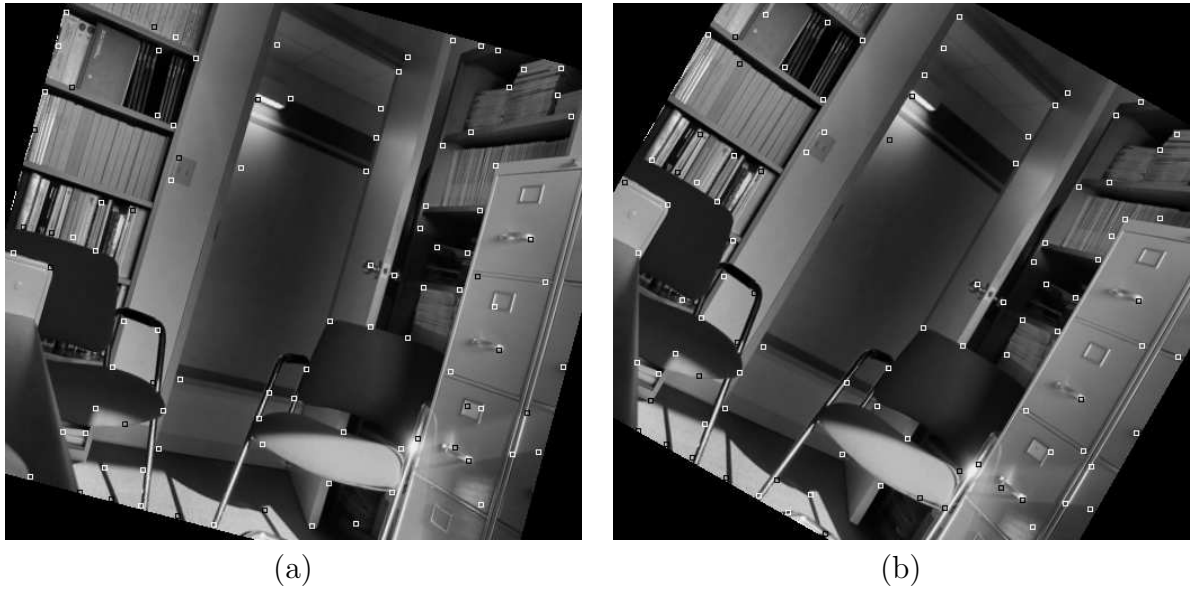


Fig. 3.2 Stable corners detected by Algorithm 3.1 when rotating the image in Fig. 3.1 by (a) 15 degrees and (b) 30 degrees. The corners in each image show those persisting from $\sigma = 1.5$ to $\sigma = 3$ pixels.

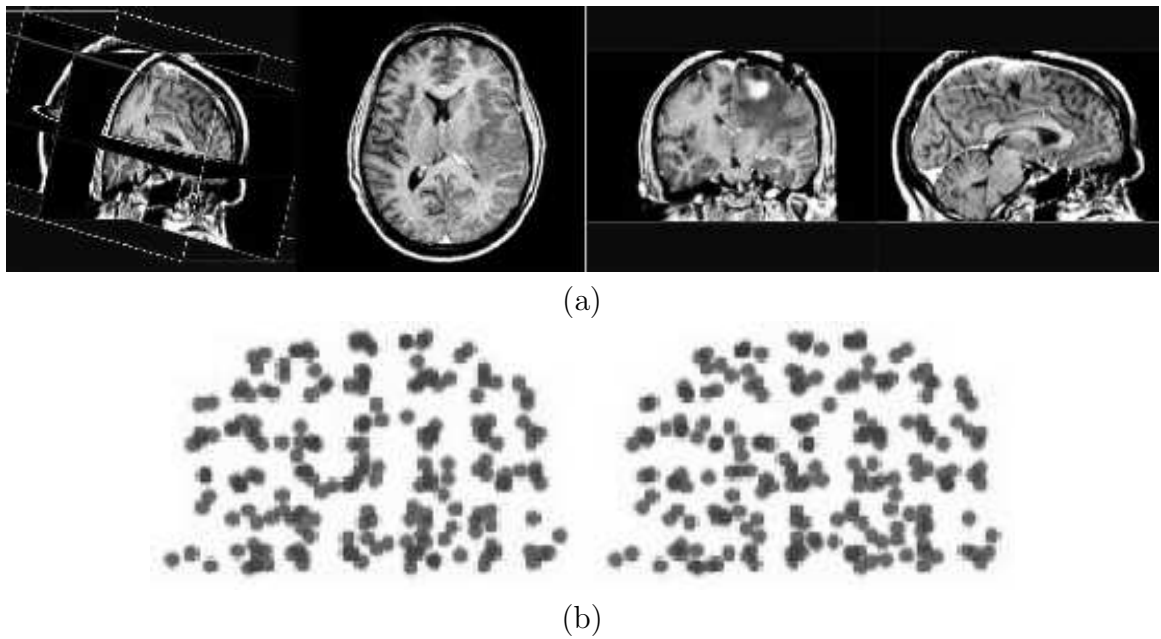


Fig. 3.3 (a) An MR brain image of size $256 \times 256 \times 128$ voxels. The leftmost plate shows three orthogonal cross-sections of the image in 3-D and the three plates to its right show the individual cross-sections. (b) The most informative, unique, and widely dispersed 200 control points detected by Algorithm 3.2 using $\sigma = 2.5$ pixels are shown in stereo.

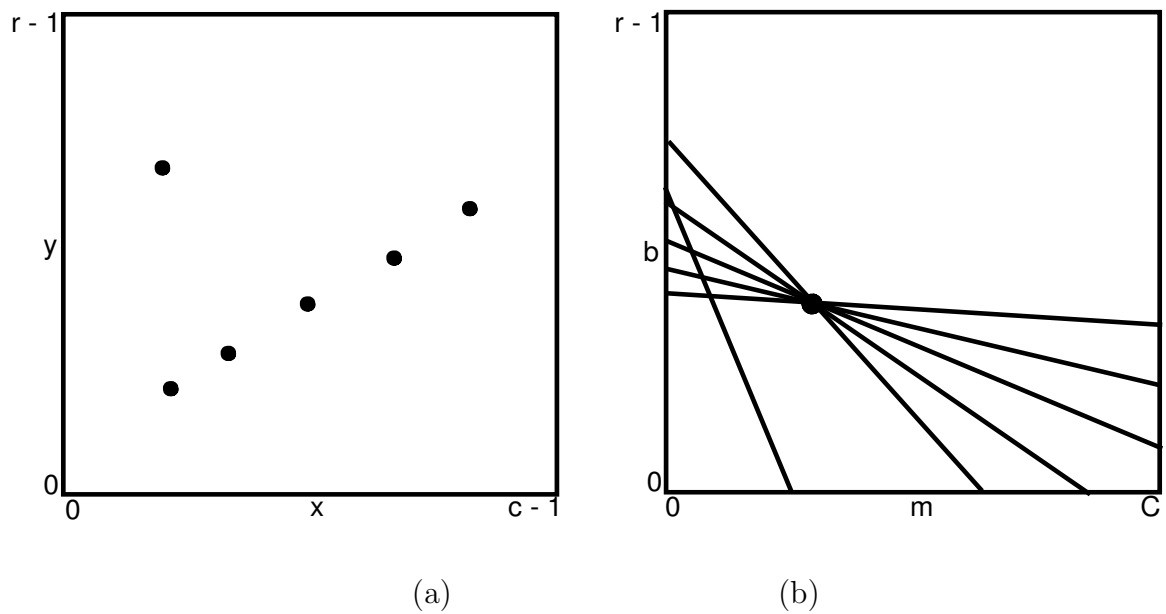


Fig. 3.4 (a) Points in an image. (b) Corresponding lines drawn in the parameter space (accumulator array). Points on a line in the image space produce lines that intersect at the same point in the parameter space, while random points in the image space produce random lines in the parameter space.

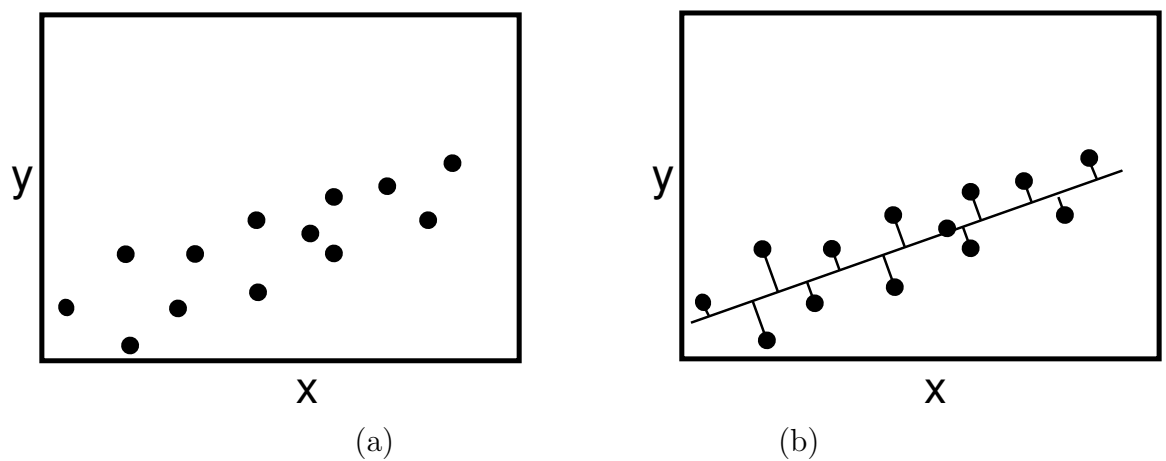


Fig. 3.5 (a) A set of noisy points and (b) the line fitting to it by the least-squares method. The process minimizes the sum of squared distances of the points to the line.



(a)



(b)



(c)



(d)

Fig. 3.6 (a) An office image. (b) Canny edges of the image obtained with a Gaussian smoother of standard deviation 1.5 pixels. The weak edges have been removed. (c), (d) Lines in the edge image detected by the least-squares line-fitting method with tolerances of 2 and 4 pixels, respectively. Very short line segments have been discarded.



(a)



(b)



(c)



(d)

Fig. 3.7 (a) An office image. (b) Lines in the image determined by Algorithm 3.3 using a Gaussian smoother of standard deviation 1 pixel, grouping connected pixels with gradient magnitudes within $\pi/8$ of each other into regions starting from $-\pi/16$, removing pixels in a region with gradient magnitudes smaller than 3 and discarding regions containing fewer than 50 pixels. (c) Lines detected when changing the standard deviation of the Gaussian smoother to 2 pixels but keeping other parameters the same as those in (b). (d) Lines obtained when discarding regions containing fewer than 100 pixels, but keeping other parameters the same as those in (b).

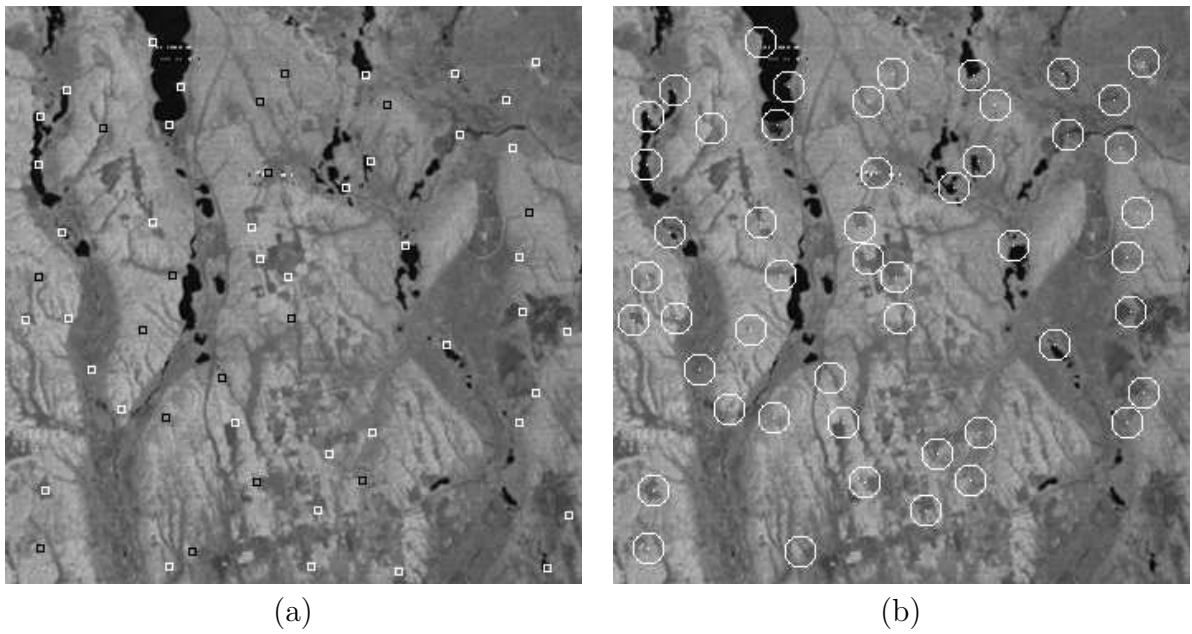


Fig. 3.8 (a) Control points and (b) templates selected in a satellite image.