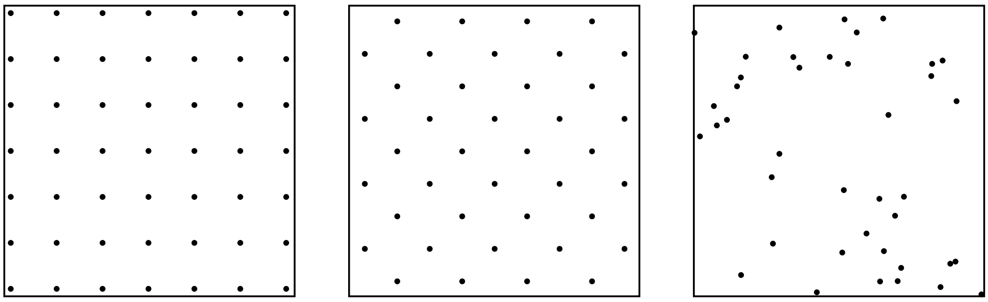

Fig. 1. Regular and random point patterns.

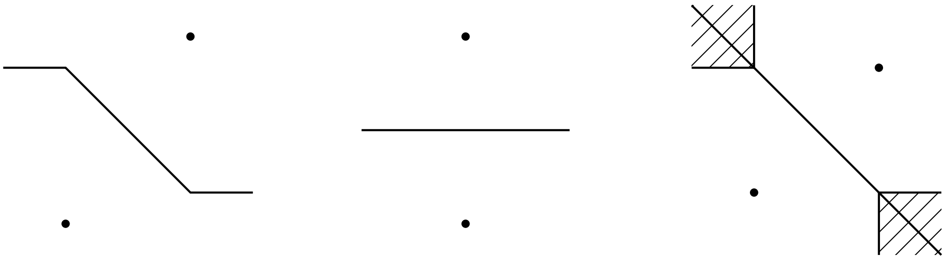

Fig. 2. Bisector defined with rectilinear distances.

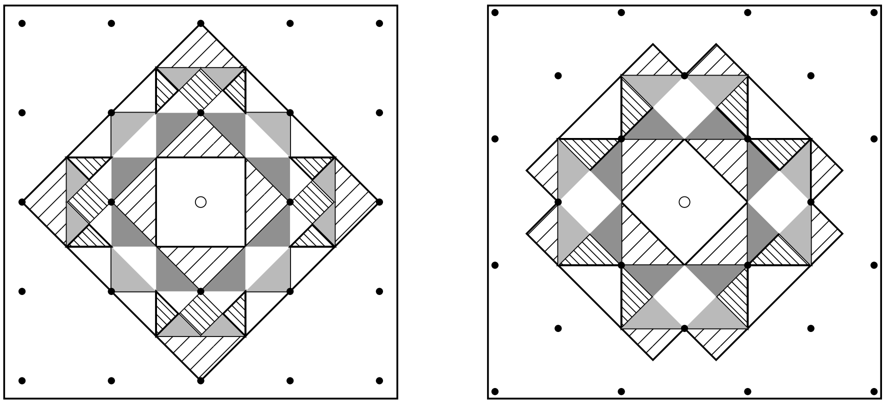

Fig. 3. kth nearest regions.

nearest distance distributions $f_k(r)$ ($k = 1, 2, \ldots, 8$) for the two regular patterns.

Let $S_k(r)$ be the area of the region such that $R_k \leq r$ in the study region. Then the cumulative distribution function of R_k, denoted by $F_k(r)$, which is the probability that $R_k \leq r$, is

$$F_k(r) = \frac{S_k(r)}{S} \tag{1}$$

where S is the area of the study region. Differentiating Eq. (1) with respect to r gives the kth nearest distance distribution $f_k(r)$ as

$$f_k(r) = \frac{1}{S}\frac{\mathrm{d}S_k(r)}{\mathrm{d}r}. \tag{2}$$

To obtain $S_k(r)$, we first define the bisector with rectilinear distances. The shape of the bisector is classified into three types as shown in Fig. 2. If the line through two points has angle $\pi/4$ or $3\pi/4$ with the x-axis, the bisector consists of not only a straight line but also an area as shown in Fig. 2(c); see Lee (1980). To avoid the indeterminacy, we define the bisector as the straight perpendicular line, as suggested by Okabe *et al.* (2000).

Since we assume that regular patterns continue infinitely, $S_k(r)$ can be calculated by considering only one point. Figure 3 shows the regions where the white point is the kth nearest. We call these regions the kth nearest regions. The innermost square is the nearest region, and the outside of it is the second nearest region, followed by third, fourth, ..., eighth nearest regions. These kth nearest regions cor-