where $\bar{z}_i$ is the estimated mean value of Z_i.

In practical applications, averaging over intervals of both distance and direction of $\boldsymbol{h}$ is often applied in 1-D representations of $\hat{C}_{ij}$ or $\hat{\gamma}_{ij}$. This 1-D representation is often shown for each direction class at a time plotting $\hat{C}_{ij}$ or $\hat{\gamma}_{ij}$ as a function of distance classes. To reflect this averaging, $\boldsymbol{\Sigma}_k = \{\hat{C}_{ij}\}, k = 1, \ldots, n$, where n is the number of 1-D distance and direction classes, can be calculated.

When averaging is performed over sufficiently large areas, the variables z_i and z_j need not be sampled in exactly the same locations to estimate $\hat{C}_{ij}$. In case of such non-corresponding spacing, $\hat{C}_{ij}$ is referred to as a **cova function**, cf. Herzfeld (1990).

Another estimator for the crossvariogram is

$$\hat{\gamma}_{ij}(\boldsymbol{h}) = \frac{1}{2}[\hat{\gamma}^{+}_{ij}(\boldsymbol{h}) - \hat{\gamma}_i(\boldsymbol{h}) - \hat{\gamma}_j(\boldsymbol{h})]. \tag{1.19}$$

After separate modelling of $\hat{\gamma}_i$, $\hat{\gamma}_j$ and $\hat{\gamma}^{+}_{ij}$ it is necessary to verify that this equation holds for the models also.

1.3 The Sample 2-D Crossvariogram

If averaging over the Cartesian coordinates of $\boldsymbol{h}$, h_x and h_y, rather than averaging over the polar coordinates of $\boldsymbol{h}$ is considered, 2-D representations of $\hat{C}_{ij}$ or $\hat{\gamma}_{ij}$ can be estimated as ordinary image data with pixel size $h_x \times h_y$. In Figure 1.1 this 2-D crossvariogram concept is sketched. For each point in the data set we consider all points with relative position inside each square, e.g. the solid one. For all such point pairs we calculate $\hat{C}_{ij}$ or $\hat{\gamma}_{ij}$ and place the estimate as a pixel value in the pixel situated as indicated by the solid square. If $i = j$ the resulting image is the experimental 2-D semivariogram. This 2-D notion of the crossvariogram, which is also described in GAF, MAYASA, IMSOR, & DLR (1993), Conradsen, Nielsen, Windfeld, Ersbøll, Larsen, Hartelius,

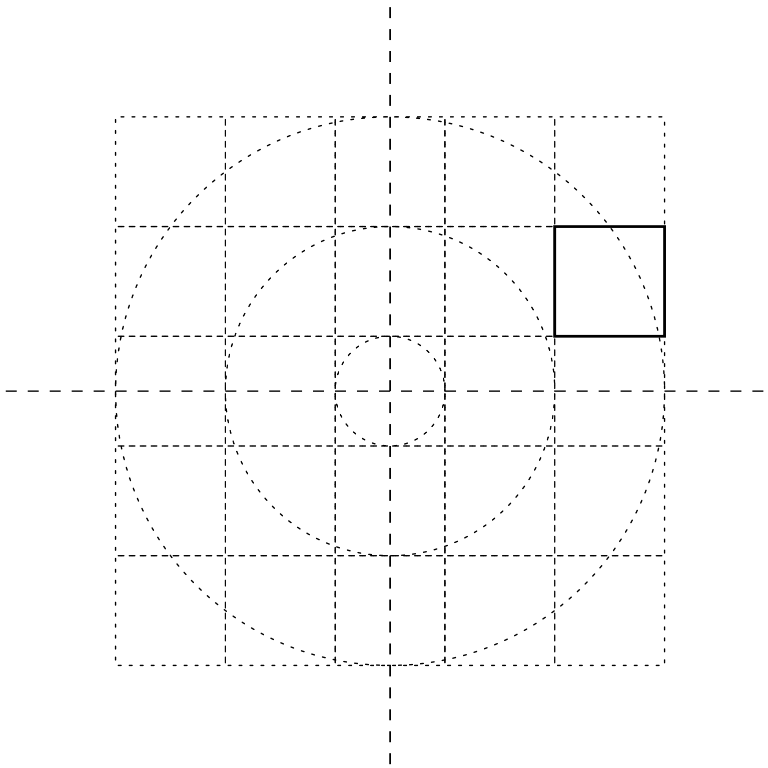

Figure 1.1: Sketch of 2-D semivariogram concept