# CORRELATION THEORY OF ONE CLASS OF INGOMOGENEOUS RANDOM FIELDS

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The problem of reconstructing inhomogeneous discrete random fields from the spectrum and representing discrete random fields as a superposition of the simplest random fields (spectral decompositions) is considered.

Consider a discrete random field $\xi(n,p)$ with correlation function (CF)

$$K(n,p,m,q)=M\xi(n,p)\overline{\xi(m,q)},\quad M\xi(n,p)=0.$$

Let us introduce the following functions of discrete argument $V(n,p,m,q)$ $W(n,p,m,q)$, which we will call partial correlation differences:

$$V_1(n,p,m,q)=K(n,p,m,q)-K(n+1,p,m+1,q),$$
$$V_2(n,p,m,q)=K(n,p,m,q)-K(n,p+1,m,q+1),$$
$$V(n,p,m,q)=K(n,p,m,q)-K(n+1,p,m+1,q)-$$
$$-K(n,p+1,m,q+1)+K(n+1,p+1,m+1,q+1),(V_1,V_2,V)$$
$$W_1(n,p,m,q)=K(n+1,p,m,q)-K(n,p,m+1,q),$$
$$W_2(n,p,m,q)=K(n,p+1,m,q)-K(n,p,m,q+1),$$
$$W(n,p,m,q)=K(n,p+1,m+1,q)+K(n+1,p,m,q+1)-$$
$$-K(n+1,p+1,m,q)-K(n,p,m+1,q+1).$$

These correlation differences characterize the deviation of a random discrete field from a homogeneous one $(V_1,V_2,V)$ (CF depends on the difference of arguments) or on the Hankel $(W_1,W_2W)$ (CF depends on the sum of arguments).

Using partial correlation differences, one can introduce an important class of heterogeneous (non-Hankel) random fields.

1. $V(n,p,m,q)=\left(1-|\lambda_1|^2\right)\left(1-|\lambda_2|^2\right)\lambda_1^n\overline{\lambda_1^m}\lambda_2^p\overline{\lambda_2^q}M\left|\xi_0(\omega)\right|^2.$

From this it is clear that the condition of dissipativity of a quasi-homogeneous field: $|\lambda_j|<1\quad(j=1,2)$. Under these conditions, the other two quadratic forms defined $V_1,V_2$ are also non-negative.

2. $W(n,p,m,q)=2\operatorname{Im}\lambda_1 2\operatorname{Im}\lambda_2\lambda_1^n\overline{\lambda_1^m}\lambda_2^p\overline{\lambda_2^q}M\left|\xi_0(\omega)\right|^2.$

In this case, the dissipativity condition of the quasi-Hankel field takes the form $\operatorname{Im}\lambda_j\quad(j=1,2).$