ABOUT ONE METHOD OF CALCULATION AVERAGE VALUE OF THE PARAMETER USING MEASUREMENTS' WEIGHTS

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Idea of attributing to measurements of various weights at calculation of measures of the central tendency is well known. These weights specify hierarchy of the importance of this or that measurement. The priority can be established according substantial, technological or statistical reasons.

Here we suggest the following method iterative algorithm calculating. Let $\{N_i\}$ - set of I independent ways of measurements true value of a parameter N_R. Weight functions on an iterative step j are calculated using the formula

$w_{ij} = \frac{1}{\sigma_j\sqrt{2\pi}}\exp[(N_i - \overline{N}_{j-1})^2/2\sigma_j^2]$. $\sigma_j = \frac{\sqrt{\sum_i (N_i - \overline{N}_{j-1})^2}}{I-1}$ - a root-mean-square deviation $\overline{N}_j = \frac{\sum_i N_i w_{ij}}{\sum_i w_{ij}}$ - resulting value for the given step. $\overline{N}_0 = \frac{\sum_i N_i}{I}$.

The sequence of calculations determining the process converge. $\lim_{j\to\infty}\overline{N}_j = N_R$. The real computing process can be finished, when $|\overline{N}_{j-1} - \overline{N}_j| < 10^{-5}$. The choice of criterion of the ending of the iterative process in practice can be done by the researcher according substantial reasons in investigated area. Within social research sufficient condition is an inequality $|\overline{N}_{j-1} - \overline{N}_j| < 10^{-3}$, for technological processes connected for example with measuring of temperature inside nuclear power plant reactor the difference should not exceed 10^{-5}.

The absolute error of calculation N_R is defined as a diameter of a confidential interval with the chosen level of significance α. $\Delta_\alpha = \frac{\sigma_j}{\sqrt{I}}K_\alpha$. Two ways of determination limits of the confidential interval can be used. In the case when the decision is accepted on the basis of results of many numbers of measurements, $K_\alpha = z_{1-\alpha/2}$ (z – fractile of normal distribution). In the case of a small number of measurements we recommend to use less strict Student coefficient $K_\alpha = t_{1-\alpha/2}$ (t – fractile of Student distribution). The relative error is calculated under the formula $\delta_{1-\alpha} = \frac{\Delta_{1-\alpha}}{\overline{N}_j}$.

This algorithm can be use for analysis technical and social data.