IMPORTANCE FUNCTION APPLICATION (Harrington SCALE) IN PROBLEMS OF MUTIOBJECTIVE OPTIMISATION IN CONFECTIONERY RECIPES

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Keywords: criterion,indexes, technology

When analyzing technological processes that simultaneously depend on several factors of different nature, results are often received as values of different characteristics - partial criteria. For math modeling of such research important problem is to find the target function – combination of several separate criteria $f_1, f_2 \ldots f_N$ into one general criteria of efficiency $F = F(f_1, f_2, \ldots f_N)$, which is a mandatory component of multiobjective optimization problems. As partial criteria have got different meanings and therefore different units of measurement, the value of partial criteria are to be transfered into dimensionless quantities, by normalizing them with the largest possible value - $\frac{f_i}{f_i^{\max}}, i = \overline{1,N}$, or in a various way.

However, it happens that the transaction of normalizing is not enough to ensure the homogeneity of indicators for their rational amalgamation into a single criteria of effectiveness. For example, among the parameters which values are normalized to a change in the interval $[0;1]$, the value of 0.75 for one of the indicators may be good, but for another - unsatisfactory. To combine these indicators ia a correct way it is suggested to apply the scale of importance, which transferes the individual indicators (empirical or psychological numerical form) into numeric values of a scale of importance. The main numeric marks of scale of importance are the points of a curve, that is increasing from 0 to 1 and is analytically described by the function

$$d(f) = \exp(-\exp(-(kf - a))), \qquad (1)$$

where a, k - are constant values, different for each criteria, that depend on the numerical values of the criteria.

For example, for the production of cream it is suggested to find optimal correlation of ingredients on technological indexes. For each indicator (partial criteria) a graph of recalcilation is built in terms of a function of importance (1), or there is a function that approximates separate values of a certain criteria (for example, by the method of least squares) $d_i = d(f_i), i = \overline{1,N}$. For a generalized estimation the quality of the product the criteria of "quality polygon" must be used:

$$F = d_1 d_2 + d_2 d_3 + d_3 d_4 + d_4 d_5 + d_5 d_1, \text{ or } F = \sum_{i=1}^{4} d_i d_{i+1} + d_1 d_5. \qquad (2)$$

The advantage of a criteriA (2) is its sensitivity to possible excessive reduction of some of the criteria and simplicity in usage. The best pattern is with a maximum value of a function (2).