

Evaluating the quality of heterogeneous robotic systems using the Banker-Charnes-Cooper model

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Abstract. The paper proposes a method for evaluating and determining the ways for improving the quality of heterogeneous robotic systems that consists of private methods. It is based on the developed complex of mathematical models that is based on the methodology of the data envelopment analysis.

One of the features of the data envelopment analysis by evaluating complex system effectiveness is the fact that the object under study has a variety of input and output heterogeneous parameters. In this case, the solution of the problem is carried out under conditions of heterogeneity of the parameters, which is of particular importance in the case of system heterogeneity. After complex mathematical transformations, modeling based on the data envelopment analysis makes it possible to “compare something noncomparable”. The method for evaluating the quality of heterogeneous robotic systems supposes a certain number of factors described in the paper. It is based on the developed mathematical models for evaluating the quality of heterogeneous robotic systems and theoretical provisions on the quality criteria the object under study.

The paper shows that if the constraints make it necessary to achieve the maximum level of the output indices at fixed values of the entry indicators, then we should choose the developed model for the analysis of heterogeneous robotic systems based on the Banker-Charnes-Cooper output model of the data envelopment analysis. This mathematical model allows analyzing the quality of heterogeneous robotic systems in conditions of possible cost reduction with fixed values of output characteristics.

If the determination of the ways of improving the quality of heterogeneous robotic systems is carried out under conditions of possible simultaneous changing of the values of both input and output parameters, then we choose a synthesis model based on the additive model of methodology of the data envelopment analysis.

Keywords: heterogeneous robotic systems, data envelopment analysis, quality evaluation, technical level, Banker-Charnes-Cooper model.

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