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Multi-Objective Economic-Statistical Design of MEWMA Control Chart

Amirhossein Amiri, Hamed Mogouie and Mohammad H. Doroudyan
Department of Industrial Engineering
Shahed University, Tehran, Iran

Abstract

The various advantages of MEWMA control chart such as the ability to detect small shifts in the process with multiple quality characteristics have motivated users to apply this chart for process monitoring. Considering the high costs of implementing MEWMA control chart, the economic-statistical design of this chart has been increasingly investigated. In most of the previous studies the cost function has been considered as the objective function while the statistical properties have been modeled as constraints in a mathematical programming. According to the dependency of the cost function on statistical properties in the constraints, the results of these methods are not efficient enough. In this paper a multi-objective approach is applied which has been optimized using a genetic algorithm. The main contribution of this paper is that we consider the cost function and statistical properties as objectives aggregated in an additive function, leading to better optimization results. The proposed method has been evaluated through a numerical example from the literature and the efficiency of the method has been compared in comparison with the previous methods.

Keywords
MEWMA control chart, economic-statistical design, Lorenzen and Vance cost function, multi-objective approach, genetic algorithm