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On the Design and Performance of a Control Chart for Monitoring Continuous data in (0,1) when Process Parameters are Unknown

In this work, we consider monitoring continuous data in the unit interval and investigate the statistical design and performance of a two-sided Shewhart chart when the process parameters are unknown. The most common distribution assumed for such data is the Beta distribution. Although control charts based on the Beta distribution have been studied by several authors, the case of estimated parameters, which is the most practical case, has not been considered in much detail in literature. The chart's performance is investigated in a Monte Carlo study, and empirical rules are provided regarding the size of the Phase I sample. Also, we explore the effectiveness of possible adjustments to the control limits of the chart, which take into account the size of the available Phase I sample data. The performance of the chart is also investigated for several out-of-control situations. The results show that for Phase I samples of small to moderate size, practitioners need to choose between guaranteed in-control performance or improved out-of-control performance. A numerical example based on real data is also provided.

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Special/ Invited session

Classification

Mainly methodology

Keywords

Beta distribution, Conditional Average Run Length, Maximum Likelihood Estimation

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