

Improved process capability assessment through semiparametric piecewise modeling

NIXON JEREZ-LILLO*, VINICIUS DA COSTA SOARES,
PAULO HENRIQUE FERREIRA, PEDRO LUIZ RAMOS

**Pontificia Universidad Católica de Chile*

Resumo

Piecewise models have gained popularity as a useful tool in reliability and quality control/monitoring, particularly when the process data deviates from a normal distribution [1]. In this study, we develop maximum likelihood estimators (MLEs) for the process capability indices, denoted as C'_{pk} , C'_{pm} , C'^*_{pm} and C'_{pmk} , using a semiparametric model. To remove the bias in the MLEs with small sample sizes, we propose a bias-correction approach to obtain improved estimates [2]. Furthermore, we extend the proposed method to situations where the change-points in the density function are unknown. To estimate the model parameters efficiently, we employ the profiled maximum likelihood approach [3]. Our simulation study reveals that the suggested method yields accurate estimates with low bias and mean squared error. Finally, we provide real-world data applications to demonstrate the superiority of the proposed procedure over existing ones.

Referências

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Tipo de Apresentação: COMUNICAÇÃO ORAL

*e-mail: njerez1@mat.uc.cl