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Distribution Free Change Point Control Charts for Monitoring Time Between Events and Amplitude Data

Monitoring the occurrence of undesirable events, such as equipment failures, quality issues or extreme natural phenomena, requires tracking both the time between events (T) and their magnitude (X). Time Between Events and Amplitude (TBEA) control charts have been developed to monitor these two aspects simultaneously. Traditional approaches assume known distributions for T and X. However, in practice, identifying the true distribution of these variables is challenging. To address this difficulty, distribution-free TBEA control charts have been proposed. Furthermore, in addition to signaling an alarm (i.e. identifying the detection time), it is often beneficial to estimate the instant at which the change occurred (i.e. the change-point time). Knowing when a shift occurred in a TBEA statistic can help trace potential causes and improve overall process understanding. This study proposes non-parametric change-point control charts for monitoring TBEA data. Through a simulation experiment and a case study, the statistical properties of the change point control charts are evaluated and compared with those of a control chart specifically designed for monitoring time between events and amplitude data. The results suggest that change-point control charts can be effectively used within the time between events and amplitude framework, providing valuable support in process management.

Special/ Invited session

SIS Invited Session: Statistical methods, applications and recent developments for the technogical field

Classification

Both methodology and application

Keywords

Control Charts; Distribution Free; Detection Time; Change-Point Time; Climate Change

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