Calibration of a joint monitoring scheme with cautious parameter learning for guaranteed in-control performance

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Joint monitoring of the mean and variance of a normal process is crucial in quality engineering for assessing homoscedasticity, determining process capability, and recognizing that changes in scale often accompany changes in location. A joint scheme for monitoring both mean and variance must ensure overall performance, even with estimated parameters. Approaches guaranteeing minimum in-control performance are standard, but they lose power with small Phase I samples. Learning approaches allow parameter re-estimation with new data, while cautious schemes define update rules to minimize sample contamination from out-of-control observations [1,2,3].

The challenge in setting up a joint monitoring scheme with cautious parameter learning for guaranteed in-control performance lies in the determination of the individual control limits, in particular the determination of the constants that govern the guaranteed in-control performance. This presentation outlines the problem, discusses the solution recently put forward in [4], and highlights potential for additional research.

Keywords: Cautious parameter learning, Estimated parameters, Joint monitoring, Statistical process monitoring

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