IAP PROJECT StUDyS

Université de Liège
– METHODOLOGICAL STATISTICS –

STATISTICS SEMINAR

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The difficulty in designing control charts with estimated parameters

The performance of control charts, such as the Shewhart $\bar{X}$ control chart, with estimated in-control parameters has been widely discussed in the literature. Previous studies showed, for example, that at least $400/(n-1)$ Phase I samples, where $n > 1$ is the sample size, are required so that the $\bar{X}$-chart performs on average as if the in-control process parameter values were known. This recommendation was based on the in-control expected average run length (ARL) performance. The reliance on the expected ARL metric, however, neglects the practitioner-to-practitioner variability. This variability occurs due to the different historical data sets practitioners use, which results in varying parameter estimates, control limits, and in-control ARL values.

In this presentation, it is shown that taking this additional type of variability into consideration leads to much larger Phase I samples, far beyond what many previous researchers have recommended, in order to have low levels of variation of in-control performance among practitioners. The standard deviation of the ARL (SDARL) metric is used to evaluate performance for various amounts of Phase I data. Surprisingly, we show that for a variety of charts no realistic Phase I sample size is sufficient to have confidence that the attained in-control performance is close to that desired. These results have significant implications on the relationship between process monitoring theory and practice. An alternative approach is presented for designing control charts.

Friday, May 9, 2014 - 14h30 - Room 025 (Building N1)
Rue Louvrex 14, 4000 Liège

This seminar is a jointly organized with QuantOM (HEC)

Short biography

William H. Woodall is a Professor of Statistics at Virginia Tech. He is a former editor of the Journal of Quality Technology (2001?2003) and associate editor of Technometrics (1987?1995). He has published well over 100 papers, most on different aspects of process monitoring. He is the recipient of the ASQ Shewhart Medal (2002), ENBIS Box Medal (2012), Jack Youden Prize (1995, 2003), ASQ Brumbaugh Award (2000, 2006), Ellis Ott Foundation Award (1987), Soren Bisgaard Award (2012), and a best paper award for IIE Transactions on Quality and Reliability Engineering (1997). He is a Fellow of the American Statistical Association, a Fellow of the American Society for Quality, and an elected member of the International Statistical Institute.