

A Case Against a Few Traditional Quality Control Charts

Manuel Cabral Morais

DM-IST & CEMAT, University of Lisbon, Portugal


maj@math.ist.utl.pt

A quality control chart is essentially a graphical device used to monitor a parameter of a measurable characteristic X of a process with the purpose of establishing whether it is operating within its limits of expected variation. An observation of the plotted control statistic beyond the control limits is considered indicative of a change in the parameter being monitored.

The control limits of most traditional quality control charts tend to be set ignoring the skewness character of the control statistic and this may dramatically affect their performance. For instance, the quality control operator or engineer may deal with a chart with the ability to detect only increases in the parameter in a timely fashion.

In this talk, we explore the notions of uniformly most powerful unbiased tests to eliminate the bias of the average run length (ARL) performance curve function of a few traditional quality control charts.

The proposed ARL-unbiased designs can be easily implemented and are associated with ARL curves that attain a maximum when the process is in-control, hence we are alerted to any improvement or deterioration of the process quality in less time (in average) than to a false alarm. Furthermore, we capitalize on the randomization of the emission of a signal to bring the false alarm rate to a pre-stipulated and desired value when we are dealing with discrete control statistics.

We use *software*  to provide striking illustrations of these ARL-unbiased designs.

(Joint work with Sven Knoth – Helmut Schmidt University, knoth@hsu-hh.de – and Sofia Paulino – IST-UL, sofia.r.paulino@gmail.com)