

Abstract

Statistical process control (SPC) involving multiple Poisson correlated variables can be done with a multiple scheme. In other words using a chart to control each variable or, alternatively, a multivariate scheme based on the monitoring of all variables using a single control chart.

The charts studied before writing this thesis have a limitation. Previously, the values of their control limits have to be integers, due to the nature of their statistical (the sum of Poisson variables (MP chart), Maximum Poisson variables (MX chart) or Difference Poisson variables (DF chart)). This made it very difficult to achieve the required probability of false alarm because control charts were produced with a high number of false alarms, or that were not powerful enough to detect changes in the process.

The aim of this thesis is to propose multivariate charts that show good performances and that can achieve the required probability of false alarm. Two control charts are proposed: first, the linear combination of the correlated Poisson variables, LCP chart, and, second, and EWMA (Exponentially Weighted Moving Average) version of the LCP chart. The control limits of both graphs are not necessarily integers, making it possible to achieve the desired probability of false alarm.

To optimize the parameters of the charts, Genetic Algorithms are used to minimize the average number of samples in order to detect a specific change and to get the required probability of false alarm. Furthermore, Markov chains are used to calculate performance measures for the LCP EWMA chart.

Software was developed to optimize the parameters of the charts studied in this thesis. Also, an evaluation of performance was carried out in which the LCP chart shows the better results than the MP, MX, DF charts and the multiple scheme (one chart per

variable). Additionally, the EWMA LCP chart outperformed the LCP chart because it is more efficient in detecting small changes.