Abstract

Multivariate control charts are a recent contribution to the control of processes, being the Hotelling T^2 chart the most implemented because of its ease of use. For this reason we seek to enhance its use, without complicating or giving additional work to the processes owners.

Considering the good results obtained by predecessors graphic methodologies which vary the sample size, this thesis raises the possibility of obtaining better results by adaptively varying the number of variables involved in controlling the process; thereby achieving a reduction in average run length. The application of such methodology will also reduce costs associated with sampling, using all variables involved in the process only when necessary.

To achieve the objectives of this thesis, we made use of Markov chains and heuristics methods (genetic algorithms). Computer programs were developed to facilitate the design of the proposed control charts, which work with variable dimensions, p_1 and p ($p_1 < p$). The graphics developed in this thesis are of Doble Dimension (DDT^2) and Variable Dimension (VDT^2). To display the results we present tables of analyzes comparing the results of graphics and MCUSUM and Hotelling T^2 control chart. Additionally, we performed a sensitivity analysis of the optimal graph.

The proposed graphics are able to reduce the out of control ARL with respect to Hotelling T^2 control chart. The out of control ARL of proposed graphics for all analyzed cases exhibited a better performance than those obtained by T^2 control chart with only the first p_1 variables, and in most cases when compared to the performance achieved with T^2 control chart with all p variables.

The proposed control charts were able to reduce the costs associated with sampling. With increasing the values of p_1 and p the percentage of times all the variables were used increased. However, we observed the opposite effect with the distances d and d_1. For this reason, we can say that at small distances and greater number of variables, we

get the highest percentage of times the p variables are used when the process is in control (high cost of sampling, although cheaper than always using all p variables). Conversely, when considering a few parameters and greater distances, this percentage is low, greatly reducing the cost of sampling.