World Academy of Science, Engineering and Technology
International Journal of Computer and Information Engineering
Vol:16, No:08, 2022

Statistical Design of Synthetic VP X-bar Control Chat Using Markov Chain Approach

Authors : Ali Akbar Heydari

Abstract : Control charts are an important tool of statistical quality control. Thesecharts are used to detect and eliminate unwanted special causes of variation that occurred during aperiod of time. The design and operation of control charts require the determination of three design parameters: the sample size (n), the sampling interval (h), and the width coefficient of control limits (k). Thevariable parameters (VP) x-bar controlchart is the x-barchart in which all the design parameters vary between twovalues. These values are a function of the most recent process information. In fact, in the VP x-bar chart, the position of each sample point on the chart establishes the size of the next sample and the timeof its sampling. The synthetic x-barcontrol chartwhich integrates the x-bar chart and the conforming run length (CRL) chart, provides significant improvement in terms of detection power over the basic x-bar chart for all levels of mean shifts. In this paper, we introduce the syntheticVP x-bar control chart for monitoring changes in the process mean. To determine the design parameters, we used a statistical design based on the minimum out of control average run length (ARL) criteria. The optimal chart parameters of the proposed chart are obtained using the Markov chain approach. A numerical example is also done to show the performance of the proposed chart and comparing it with the other control charts. The results show that our proposed syntheticVP x-bar controlchart perform better than the synthetic x-bar controlchart for all shift parameter values. Also, the syntheticVP x-bar controlchart perform better than the VP x-bar control chart for the moderate or large shift parameter values.

Keywords : control chart, markov chain approach, statistical design, synthetic, variable parameter
Conference Title : ICASDA 2022 : International Conference on Applied Statistics and Data Analytics
Conference Location : Venice, Italy
Conference Dates : August 16-17, 2022