Regression Based Multivariate Control Chart

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Abstract:

*There are many variations of the regression analysis map that can be used to enhance process control and quality yield in manufacturing. A huge number of useful industrial applications have been developed based on regression control charts, such as the Shewhart control chart for regression residuals, the exponentially weighted moving average (EWMA) control for regression control charts, and, and so on. In this study we consider **multivariate** T2 control chart based on regression .To evaluate the performance of control chart based on three different models for various rational sub group sample sizes for monitoring location parameters via simulation .*

Key words: simple linear regression, ARL,T2 Control chart

Introduction:

Quality can play an important role in the success and achievement of various service and manufacturing industries. Statistical Process Control (SPC) is an excellent and most effective process monitoring method, which can be used in the manufacturing industry to attain the process stability and to improve the quality of the output of the process by reducing the amount of variation. The variation in the output is classified into chance cause of variation (random cause of variation) and assignable cause of variation (non random cause of variation or Special cause of variation).The chance cause of variation or background noise is due to small and unavoidable causes. The chance cause of variation is the essential part of the any production process and in the presence of this variation; the process is statistically in control (stable and predictable). The second assignable cause of variation is targeted by Statistical Process Control. A process in the presence of assignable cause of variation is said to be out of control (unstable and unpredictable) .SPC techniques are available to detect the presence of special cause of variation in the production process. The Control chart is one of the important tool in SPC Kit.It is a real time ,time ordered ,graphical process feedback tool designed to tell an operator when significant changes have occurred in the production process. The original concept of the control chart was proposed Shewhart (1924) and it has been used extensively in industry since the Second World War especially in Japan and the USA after about 1980.

Control Chart as a visual tool is to determine a production process is in statistical control or not. if the control chart shows the production process is not in control then changes or correction should be made to the process parameters to ensure process and product consistency. Today control chart are a key tool for quality control.

Monitoring a process using control chart first requires expressing the in control state of the process, and then this information is used to detect out of control process state. Hence there are two different phases of a control chart application. The distinction between these two phases is important, because different types of statistical methods are appropriate for each phase.

Phase I is retrospective analysis of the observations from the process. It is an initial step. In Phase I analysis aims is to check the in control state of the process and establish an on line monitoring scheme. Identification of an exact appropriate probabilistic model for observations is essential. Based on the selected model of the observations, an appropriate control chart is selected and then the parameters required for the control chart design are estimated. Although the parameter estimation step of a Phase I analysis may be skipped when the parameters can be assumed to be known. in practice this is often not the case.

In Phase I analysis, estimated parameters are first used to calculate trial control limits of the selected control chart, and this control chart is used to identify outliers that are the points exceeding the control limits. Outliers can be classified either to correspond to an out-of-control process state or to an in-control process state. Note that a false alarm rate is also expected for an in-control process, i.e., some observations may fall close but outside the control limits even though the process operates in an in-control state without a process upset.