

Applications of Robust Statistics in Statistical Process Control

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Abstract. The influence functions are used to build up control charts to monitor multivariate complex processes. Generally, multivariate quality control problems involve the evaluation of a process based on the simultaneous behavior of quality characteristics and process parameters. When assignable causes are present in a multivariate process they may affect different process parameters: the process mean, and/or orientation and/or variability, and the special causes that effect one of these parameters do not necessarily affect the others. That is control charts for different situations are necessary. Subgroups that are taken when special causes are present in a process tend to have an unduly large influence on the estimators. Therefore the influence function can be used to tailor control charts for different process parameters: mean-variability-orientation.

This paper deals with on-line methods for quality improvement and the influence function is used to build up control charts aiming to quickly detect the presence of special causes, (shifts), in a manufacturing process. Multivariate methods based on the influence functions for monitoring processes with multivariate measurements in both product quality characteristics space and process parameters space are considered. Our approach to build up such control charts consists on monitoring the stable level of variability of the process according to the directions settled by a generalized PCA, which is based on the leading quality characteristics.

The proposed methods are illustrated with real applications from the field of automobiles and chemical processes.

Keywords: Influence function, process control, principal components, control chart, short runs.