

# Old Tool, New Purpose: Statistically Equivalent Blocks in Multivariate SPC

C. L. Holcombe<sup>1</sup>

<sup>1</sup>Department of Mathematics and Statistics, University of South Alabama, United States

Multivariate statistical process control (MSPC) charts are particularly useful when there is a need to simultaneously monitor several quality characteristics of a process. Most control charts in MSPC assume that the quality characteristics follow some parametric multivariate distribution, such as the normal. This assumption is often very difficult to justify in practice. Distribution-free MSPC charts are attractive, as they can overcome this hurdle by guaranteeing a stable (or in-control) performance of the control chart without the assumption of a parametric multivariate process distribution. Several distribution-free MSPC charts based on nonparametric hypothesis testing methods have been proposed, utilizing the natural connection between control charts and sequential testing. Recent work in the two-sample hypothesis testing literature has explored the connection between many classical nonparametric tests and statistically equivalent blocks (se-blocks). Using the se-block formulation for many classic rank, placement, and sign-type tests allows for the easy extension to the multivariate setting. These multivariate tests are computationally inexpensive, interpretable, and exactly distribution-free. The goal of this talk is to explore the potential impact of this literature on the development of MSPC charts in the unknown parameters setting. In addition to reviewing an existing control chart based on se-blocks, areas for future work are explored.

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