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Measurement System Analysis for Parts Without a Reference Point

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Many measurement system capability studies investigate two components of the measurement error, namely repeatability and reproducibility. Repeatability is used to denote the variability of measurements due to gauge, whereas reproducibility is the variability of measurements due to different conditions such as operators, environment, or time. A gauge repeatability and reproducibility (R&R) study is often conducted to estimate these two components of the measurement error variability. However, when a reference measurement point cannot be determined for parts, the selection of the measurement method and within-part variation may contribute to the estimates of measurement error. In this study, we investigate a measurement system in the existence of within-part variation for a cylindrical part without a reference measurement point. Alternative measurement methods and analysis of variance models for decomposing the within-part variation from the other components are studied. For a real-life application, cylindrical parts with elliptical cross-sections and barrel-shape along the length have been simulated using the R programming language. Estimates of operator, gauge, part-to-part, and within-part variability are studied. Recommendations are provided for practitioners working in manufacturing processes.

Type of presentation

Talk

Classification

Both methodology and application

Keywords

Measurement System Analysis, Within-Part Variability, Gauge R&R

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