



Contribution ID: 97

Type: **not specified**

Autocorrelated processes in metrology with examples from ISO and JCGM documents

Monday, 13 September 2021 16:15 (30 minutes)

It is common practice in metrology that the standard uncertainty associated with the average of repeated observations is taken as the sample standard deviation of the observations divided by the square root of the sample size. This uncertainty is an estimator of the standard deviation of the sample mean when the observations have the same mean and variance and are uncorrelated.

It often happens that the observations are correlated, especially when data is acquired at high frequency sampling rates. In such a process, there are dependencies among the observations, especially between closely neighbouring observations. For instance, in continuous production such as in the chemical industry, many process data on quality characteristics are self-correlated over time. In general, autocorrelation can be caused by the measuring system, the dynamics of the process or both.

For observations made of an autocorrelated process, the uncertainty associated with the sample mean as above is often invalid, being inappropriately low. We consider the evaluation of the standard uncertainty associated with a sample of observations from a stationary autocorrelated process. The resulting standard uncertainty is consistent with relevant assumptions made about the data generation process.

The emphasis is on a procedure that is relatively straightforward to apply in an industrial context.

Examples from a recent guide of the Joint Committee for Guides in Metrology and a developing standard from the International Organization for Standardization are used to illustrate the points made.

Keywords

Autocorrelated processes, Uncertainty

Special/invited session

Standardization

Primary authors: COX, Maurice (NPL); Dr ZHANG, Nien Fan (NIST)

Presenter: COX, Maurice (NPL)

Session Classification: Statistical Standardization

Track Classification: Metrology & measurement systems analysis