European Network for Business and Industrial Statistics

Process diagnostics using multivariate process capability indices

Tuesday, 28 June 2022 10:30 (20 minutes)

The present work is done in collaboration with an industrial partner that manufactures plastic products via an injection moulding process. Different plastic products can be produced by using metal moulds in the injection moulding machine. The moulds are complex and built utilizing various parts. High quality of mould parts is crucial for ensuring that the plastic products are produced within the desired tolerances. First, an external supplier produces and delivers pre-fabricated metal parts, which are then shaped to a specific plastic part design. The quality of the pre-fabricated parts is evaluated through the means of quality measures. The industrial partner is generally interested if the supplier delivers the metal parts according to the specified tolerances, which in the long run can help to predict unwanted failures in the injection moulding process. If the process is not capable, the industrial partner is also interested in identifying which quality measures are accountable for it.

Traditionally, univariate process capability indices have been used to measure the capability of processes to produce according to assigned specifications under the normality assumption. In the current setting, the quality measures are correlated and have different underlying distributions. Thus, the quality measures data is multivariate, correlated and is not normally distributed. The present work is exploring multivariate process indices for tackling the problem set up by the industrial partner. One important aspect to be mentioned is that the work is meant to be used in an industrial context, thus the obtained results heavily rely on simple visualization tools.

Keywords

multivariate process capability index; multivariate non-normal data; correlated data

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Session Classification: CONTRIBUTED Quality 3

Track Classification: Quality