A monitoring process and assessing process capability under a hierarchical model, Part 1.

General information
State: Published
Organisations: Department of Informatics and Mathematical Modeling
Authors: Thyregod, P. (Intern), Melgaard, H. (Intern), Iwersen, J. (Intern)
Pages: 150-167
Publication date: 2004

Host publication information
Title of host publication: Frontiers in Statistical Quality Control 7
Publisher: Physica Verlag
Main Research Area: Technical/natural sciences
Links:
Source: orbit
Source-ID: 154673
Publication: Research - peer-review › Article in proceedings – Annual report year: 2004

On Monitoring Processes and Assessing Process Capability under a Hierarchical Model, Part 2

General information
State: Published
Organisations: Department of Informatics and Mathematical Modeling
Authors: Thyregod, P. (Intern), Iwersen, J. (Ekstern), Melgaard, H. (Intern)
Pages: 168-193
Publication date: 2004

Host publication information
Title of host publication: Frontiers in Statistical Quality Control 7
Publisher: Physica Verlag, Heidelberg New York
Main Research Area: Technical/natural sciences
Links:
Source: orbit
Source-ID: 154674
Publication: Research - peer-review › Article in proceedings – Annual report year: 2004

Environmental monitoring based on a hierarchical Poisson-gamma model

General information
State: Published
Organisations: Department of Informatics and Mathematical Modeling
Authors: Christensen, A. (Ekstern), Melgaard, H. (Intern), Iwersen, J. (Intern), Thyregod, P. (Intern)
Pages: 275-285
Publication date: 2003
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Quality Technology
Volume: 35
Modelling and monitoring in injection molding

This thesis is concerned with the application of statistical methods in quality improvement of injection molded parts. The methods described are illustrated with data from the manufacturing of parts for a medical device. The emphasis has been on the variation between cavities in multi-cavity molds. From analysis of quality measurements from a longer period of manufacturing, it was found that differences in cavities was that source of variation with greatest influence on the length of the molded parts. The other large contribution to the length variation was the different machine settings. Samples taken within the same machine set-point did not cause great variation compared to the two preceding sources of variation. A simple graphical approach is suggested for finding patterns in the cavity differences. Applying this method to data from a 16 cavity mold, a clear connection was found between a parts length and the producing cavity's position in the mold. In a designed experiment it was possible to isolate the machine parameters contributing to the variation between cavities. Thus, with a proper choice of levels for the machine variables, it was possible to reduce the variation between cavities substantially. Also an alternative model for the shrinkage of parts from a multi-cavity mold is suggested. From applying the model to data from a shrinkage study, it seemed that the observed part differences were not only due to differences in cavity dimensions. A model for the in-control variation for a multi-cavity molding process was suggested. Based on this model, control charting procedures have been suggested for monitoring the quality of the molded parts. Moreover, a capability index for multi-cavity molds has been suggested. Furthermore an alternative method for in-line quality charting is suggested. The method is for continuous control by attributes, and it is an alternative to the batch oriented approach mostly used. The procedure is especially efficient for quality requirements of very low proportion non-conformities. For the proposed charts the ARL function is derived. It is shown that in the case where a non-conforming unit is only expected very rarely during sampling, a moving sum chart and a CUSUM chart are equivalent. Finally, the correlation structure of 21 process variables has been studied prior to monitoring the process. It is illustrated how the process can be analysed with multivariate techniques. It was found that two principal components reflected changes in machine set-points. Thus, there seems to be great potential in monitoring the process variables using a multivariate approach.

General information
State: Published
Organisations: Department of Informatics and Mathematical Modeling, Mathematical Statistics
Authors: Thyregod, P. (Intern), Spliid, H. (Intern), Melgaard, H. (Intern), Madsen, H. (Intern)
Publication date: Apr 2001

Publication information
Original language: English
Main Research Area: Technical/natural sciences
Electronic versions:
imm788.pdf
Links:
Source: orbit
Source-ID: 58005
Publication: Research › Ph.D. thesis – Annual report year: 2001

Acceptance sampling by variables under measurement uncertainty

General information
State: Published
Organisations: Department of Informatics and Mathematical Modeling
Authors: Melgaard, H. (Intern), Thyregod, P. (Intern), Lenz et al., H. (ed.) (Ekstern)
Pages: 47-57
Publication date: 2001

Host publication information
Title of host publication: Frontiers in Statistical Quality Control
Publisher: Physica Verlag
Main Research Area: Technical/natural sciences
Links:
On monitoring processes and assessing process capability under a hierarchical model, part 2, non-normal distributions

General information
State: Published
Organisations: Department of Informatics and Mathematical Modeling
Authors: Thyregod, P. (Intern), Iwersen, J. (Intern), Melgaard, H. (Intern)
Publication date: 2001

Host publication information
Title of host publication: VIIth Internatioanl Workshop on Intelligent Statistical Quality Control
Publisher: Institute for Improvement in Quality and Productivity
Main Research Area: Technical/natural sciences

Experiment Design for Grey Box Identification

General information
State: Published
Organisations: Department of Informatics and Mathematical Modeling, Mathematical Statistics
Authors: Sadegh, P. (Intern), Holst, J. (Intern), Madsen, H. (Intern), Melgaard, H. (Intern)
Pages: 491-507
Publication date: 1995
Main Research Area: Technical/natural sciences

Publication Information
Volume: 9
ISSN (Print): 0890-6327
Ratings:
BFI (2018): BFI-level 1
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.04 SJR 0.886 SNIP 1.102
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.012 SNIP 1.084 CiteScore 1.69
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.245 SNIP 1.357 CiteScore 1.98
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.945 SNIP 1.256 CiteScore 2.07
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.843 SNIP 1.286 CiteScore 1.84
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.889 SNIP 0.988 CiteScore 1.45
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.871 SNIP 1.217
BFI (2009): BFI-level 1
Identification of physical models
The problem of identification of physical models is considered within the frame of stochastic differential equations. Methods for estimation of parameters of these continuous time models based on discrete time measurements are discussed. The important algorithms of a computer program for ML or MAP estimation of the parameters of nonlinear stochastic differential equations are described and the implemented tool is validated with respect to bias and uncertainty of the estimated parameters. The different phases involved in identification of this type of models are considered in the thesis. This includes design of experiments, which is for instance the design of an input signal that are optimal according to a criterion based on the information provided by the experiment. Also model validation is discussed. An important verification of a physical model is to compare the physical characteristics of the model with the available prior knowledge. The methods for identification of physical models have been applied in two different case studies. One case is the identification of thermal dynamics of building components. The work is related to a CEC research project called PASSYS (Passive Solar Components and Systems Testing), on testing of building components related to passive solar energy conservation, tested under outdoor climate conditions. The second case study is related to the performance of a spark ignition car engine. A phenomenological model of the fuel flow is identified under various operating conditions of the engine. This engine submodel is important for controlling the air/fuel ratio, e.g. in a feed-forward controller.

Optimal experiment design for identification of grey-box models
Optimal experiment design is investigated for stochastic dynamic systems where the prior partial information about the system is given as a probability distribution function in the system parameters. The concept of information is related to entropy reduction in the system through Lindley's measure of average information, and the relationship between the choice of information related criteria and some estimators (MAP and MLE) is established. A continuous time physical model of the heat dynamics of a building is considered and the results show that performing an optimal experiment corresponding to a MAP estimation results in a considerable reduction of the experimental length. Besides, it is established that the physical knowledge of the system enables us to design experiments, with the goal of maximizing information about the physical parameters of interest.
Continuous Identification of a Four-Stroke SI Engine

Compact engine models often consist of a set of nonlinear differential equations which predict the time development of the mean value of the engine state variables (and perhaps some internal variables): such models are sometimes called mean value engine models. Currently a great deal of attention is focused on constructing such continuous time models and on finding their parameters. This paper shows, that it is possible to identify an engine model from a linearized version of a mean value model for a CFI four-cycle spark ignition (SI) engine. Such an approach is useful because it preserves a physical understanding of the engine throughout the identification stage. Afterwards the identification results are available for general dynamic engine studies. The identification techniques discussed in this paper include classical methods (step response) as well as modern statistical methods (Kalman filtering and Maximum Likelihood estimation). These techniques have been applied to a four cylinder SI engine. The results include an identification of the most important parameters and time constants of the engine. These are of interest for the construction of engine simulation models, for control studies and condition monitoring applications.
Projects:

**Modellering og styring af sprejtestøbeproces**
Department of Informatics and Mathematical Modeling
Period: 01/08/1997 → …
Number of participants: 7
Phd Student:
Thyregod, Peter (Intern)
Supervisor:
Melgaard, Henrik (Intern)
Spliid, Henrik (Intern)
Main Supervisor:
Madsen, Henrik (Intern)
Examiner:
Rootzén, Helle (Intern)
Bisgaard, Søren (Ekstern)
Olsen, Klaus Juel (Ekstern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Erhvervsforskerordningen
Project: PhD

**Idenffikation af dynamiske systemer i kontinuert tid**
Department of Informatics and Mathematical Modeling
Period: 01/03/1990 → 17/03/1995
Number of participants: 4
Phd Student:
Melgaard, Henrik (Intern)
Supervisor:
Hendricks, Elbert (Intern)
Holst, Jan (Intern)
Main Supervisor:
Madsen, Henrik (Intern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Gammel ordning u/skema-SU
Project: PhD