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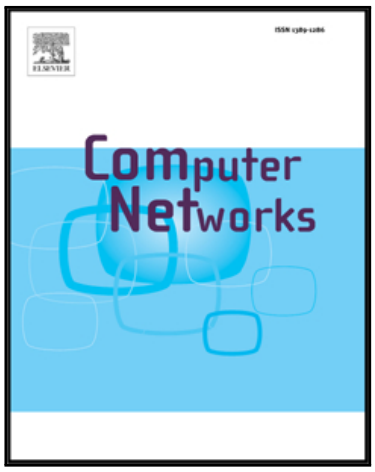

On the Use of Information Quality in Stochastic Networked Control Systems

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PII: S1389-1286(17)30250-5
DOI: 10.1016/j.comnet.2017.06.006
Reference: COMPNW 6233

To appear in: *Computer Networks*

Received date: 14 October 2016
Revised date: 31 May 2017
Accepted date: 7 June 2017

Please cite this article as: Rasmus L. Olsen, Jacob Theilgaard Madsen, Jakob G. Rasmussen, Hans-Peter Schwefel, On the Use of Information Quality in Stochastic Networked Control Systems, *Computer Networks* (2017), doi: 10.1016/j.comnet.2017.06.006

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On the Use of Information Quality in Stochastic Networked Control Systems

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Abstract

Networked control is challenged by stochastic delays that are caused by the communication networks as well as by the approach taken to exchange information about system state and set-points. Combined with stochastic changing information, there is a probability that information at the controller is not matching the true system observation, which we call mismatch probability (mmPr). The hypothesis is that the optimization of certain parameters of networked control systems targeting mmPr is equivalent to the optimization targeting control performance, while the former is practically much easier to conduct. This is first analysed in simulation models for the example system of a wind-farm controller. As simulation analysis is subject to stochastic variability and requires large computational effort, the paper develops a Markov model of a simplified networked control system and uses numerical results from the Markov model analysis to demonstrate that mmPr based optimization can improve control performance.

Keywords: Networked control system, information quality, communication networks, stochastic processes, Markov models

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