

# MODEL MIXING FOR LONG-TERM EXTRAPOLATION

Pavel Ettler<sup>1</sup>, Miroslav Kárný<sup>2</sup>, Petr Nedoma<sup>2</sup>

<sup>1</sup>COMPUREG Plzeň, s.r.o.  
306 34 Plzeň, Czech Republic

<sup>2</sup>Institute of Information Theory and Automation (UTIA)  
182 02 Praha, Czech Republic

*ettler@compureg.cz* (Pavel Ettler)

## Abstract

Reliable extrapolation – simulation or prediction – of system output is an invaluable departure point for the control system design. For application of model-based techniques, the knowledge of the model structure is essential. It can be based purely on the physical point of view or estimated from process data while the system is considered as a *black box*. Mixing of both methods results in *grey box* modelling. Often, modelled systems are governed by several known physical laws and each of these laws implies a model, which should match the data. Nevertheless inevitable uncertainties often make simulated outputs of respective models unreliable. The problem is especially pronounced for systems with a significant time delay. This motivates search for methods, which utilize all available models at once and mix their outputs with the aim to get better results. In the paper, four variants of mixing are considered, discussed and their performance compared on industrial data. Seeming alternative – a simple complex model is discussed as well. Data for experiments came from a cold rolling mill.

**Keywords:** Simulation, modelling, estimation, multiple models.

## Presenting Author's Biography

Pavel Ettler received the doctor degree in cybernetics from the University of West Bohemia in Plzeň. He worked as researcher at Škoda (Rolling Mills branch) for eleven years. In 1993 he joined COMPUREG, a company oriented to industrial control systems. His interests include identification and control of systems subject to uncertainties with application to metal processing and machine control. His involvement with research includes participation in several international and national research projects, mainly in co-operation with UTIA.

