T15. Analysis of short-term process dynamics

Nikolay Zemtsov, Moscow State University, Russia

The main goal of our research is to develop efficient methods and tools for process analysis, under monitoring a few parameters of a system dynamics.

Assume we have a hypothesis of a process flow as a mathematical model — a dynamical system $\langle\Omega,\tau\rangle$ with discreet time (a linear Abstract State Machine). Here $\Omega = R^n$ — a state space, τ — a piece wise linear transition function on Ω, permitting bounded deviation or other generalizations. The given hypothesis corresponds to the normal behavior of the process. Assume also a sequence $\gamma = (\gamma_1,\ldots, \gamma_k)$ of values $\gamma_i \in \Omega'$, obtained from monitoring. We will focus on Ω' being a finite set $\Omega' = \{1,\ldots, p\}$. It may be a set of spectra intervals, a set of possible ranges of latent variables or a set of initially finite measurements. A mapping $\pi:\Omega\rightarrow\Omega'$ (juxtaposing internal and monitored states of the system) is considered given. We are interested in the following question. If there exists a trajectory s of the process $\langle\Omega,\tau\rangle$, such that $\pi(s) = \gamma$? In other words, whether the process, corresponding to the monitored projection γ, is normal in the sense of the given hypothesis.

On the basis of the monitoring schema, described above, we have developed some effective algorithms, allowing a real-time analysis of the system behavior.