

# SIGNAL AND VARIABILITY EXTRACTION FROM ONLINE MONITORING DATA

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Automatic alarm systems used for monitoring in intensive care produce many false alarms. They simply compare measurements of physiological variables with thresholds set by the medical staff. We present methods to extract information from this data that can be used as a basis for new, improved alarm systems.

The monitored time series exhibit trends, abrupt level changes and large spikes (outliers) as well as periods of relative stability. Sudden changes in trend or shifts in level may point at a relevant event. Changes in variability can also be an important indicator of a change in the patient's health status. We present signal extraction methods based on the assumption of local linearity that are able to deal with sudden changes in trend or level in the presence of outliers (Davies, Fried, Gather, 2004; Gather, Schettlinger, Fried, 2006).

Further, we present techniques for monitoring the variability of the process. When assuming local linearity we refer to Gather and Fried (2003). Methods which do not require this assumption have been recently developed in joint work with Gelper, Schettlinger and Croux (2007).

## References

- Davies, P.L., Fried, R., Gather, U. (2004) "Robust Signal Extraction for On-Line Monitoring Data", *Journal of Statistical Planning and Inference* **122**, 65-78.
- Gather, U., Fried, R. (2003) "Robust Estimation of Scale for Local Linear Temporal Trends", *Tatra Mountains Mathematical Publications* **26**, 87-101.
- Gather, U., Schettlinger, K., Fried, R. (2006) "Online Signal Extraction by Robust Linear Regression", *Computational Statistics* **21**(1), 33-51.
- Gelper, S., Schettlinger, K., Croux, C., Gather, U. (2007) "Robust Online Scale Estimation in Time Series: A Regression-Free Approach", TR17/07, Collaborative Research Centre 475, University of Dortmund