



Correction to: Monitoring of ultra- and diafiltration processes by Kalman-filtered Raman measurements

Laura Rolinger^{1,2} · Jürgen Hubbuch¹ · Matthias Rüdert^{1,3}

Received: 3 January 2024 / Accepted: 23 January 2024 / Published online: 22 February 2024
© The Author(s) 2024, corrected publication 2024

Correction to: Analytical and Bioanalytical Chemistry (2023) 415: 841–854

<https://doi.org/10.1007/s00216-022-04477-7>

The authors regret that the sign convention in the description of the extended Kalman filter in the original publication was flawed. The state vectors \hat{x}_1 and \hat{x}_2 should have been defined as $\hat{x}_1 = E(-\Delta x)$ and $\hat{x}_2 = E(\frac{\kappa F}{V} \Delta t)$, respectively. Note that the sign of both state variables was changed. Consequently, a minus sign is missing in the exponential function of the transfer function for the first state estimate (Eq. 6 in the original publication), i.e.

$$\hat{\mathbf{x}}_{k|k-1} = \begin{bmatrix} \hat{x}_{1,k-1|k-1} \cdot e^{-\hat{x}_{2,k-1|k-1}} \\ \hat{x}_{2,k-1|k-1} \\ \hat{x}_{3,k-1|k-1} \end{bmatrix} \quad (1)$$

Two minor notation errors shall furthermore be disclosed: \mathbf{H}_k should be a row vector (defined as a column vector) and

$R_k = \sigma_w^2$ is a scalar. All other equations are correctly documented and not impacted by the disclosed errors.

As an immediate consequence of the errors coming to our awareness, we reviewed the code developed for this project. We conclude that the errors were limited to the mathematical description in the paper. The code is not affected and was correctly implemented from the beginning. Therefore, all visualizations and conclusions drawn in the paper remain valid.

For simplifying the understanding of the implemented extended Kalman filter for future readers, we are publishing a Python-based version of the code along this correction.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s00216-024-05168-1>.

Acknowledgements We would like to thank Dr. Philipp Keding for his keen lecture of the original publication, for discussing the issue with us and for reviewing this correction.

Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

The original article can be found online at <https://doi.org/10.1007/s00216-022-04477-7>.

✉ Matthias Rüdert
matthias.rudt@hes-so.ch

¹ Institute of Engineering in Life Sciences, Section IV: Biomolecular Separation Engineering, Karlsruhe Institute of Technology (KIT), Fritz-Haber-Weg 2, 76131 Karlsruhe, Germany

² Hoffmann-La Roche AG, Basel, Switzerland

³ Institute of Life Technologies, HES-SO Valais-Wallis, Rue de l'industrie 19, Sion 1950, Switzerland