J Comput Neurosci
DOI 10.1007/s10827-015-0556-6

ERRATUM

Erratum to: Information filtering by synchronous spikes in a neural population

Nahal Sharafi[1] · Jan Benda[4] · Benjamin Lindner[2,3]

Erratum to: J Comput Neurosci (2013) 34:285–301
DOI 10.1007/s10827-012-0421-9

In Section 2.5 of our paper (Sharafi et al. 2013), we gave in Eq. (39) an approximate expression for the power spectrum of the synchronous output, consisting of a zeroth-order term and three correction terms, which are proportional to the signal's variance (our small parameter). One of these correction terms was miscalculated. The correct formula in Eq. (39) should read:

$$S_{SO,SO} \simeq \alpha^2 \Bigg[\underbrace{S_{y_0,y_0} * \cdots * S_{y_0,y_0}(f)}_{\text{n terms}} + n(|\tilde{F}\chi|^2 S_{s,s}) * \underbrace{S_{y_0,y_0} * \ldots * S_{y_0,y_0}(f)}_{\text{(n-1) terms}} + n(n-1) r_0^2 (|\tilde{F}\chi|^2 S_{s,s}) * \underbrace{S_{y_0,y_0} * \ldots * S_{y_0,y_0}(f))}_{\text{(n-2) terms}} + n(n-1) r_0^2 \langle \hat{s}^2 \rangle \underbrace{S_{y_0,y_0} * \ldots * S_{y_0,y_0}(f))}_{\text{(n-2) terms}} \Bigg]. \quad (39)$$

Note that we also replaced the phrase "n-times" etc. used in the original formula by the more precise formulation "n terms".

Equation (39) in (Sharafi et al. 2013) was also used to approximate the power spectrum of the synchronous output for the special cases of populations with $n = 2$ or $n = 3$ Poisson neurons. Hence, the respective formulas for this power spectrum, Eqs. (51) and (52) in (Sharafi et al. 2013), have to be corrected as well. We recall that for Poisson neurons, we can simplify the general formula Eq. (39) using that $\chi(f) = r_0$ [Eq. (42) in (Sharafi et al. 2013)] and that $\langle \hat{s}^2 \rangle_s \approx r_0^2 D_s/(\sigma\sqrt{\pi})$ [Eq. (42) in (Sharafi et al. 2013)], assuming a high cutoff frequency of the stimulus [$f_c \gg 1/(2\pi\sigma)$].

The online version of the original article can be found at http://dx.doi.org/10.1007/s10827-012-0421-9.

✉ Benjamin Lindner
benjamin.lindner@physik.hu-berlin.de

1 Max Planck Institute for Dynamics and Self-Organization, Göttingen, Germany

2 Bernstein Center for Computational Neuroscience Berlin, Philippstr. 13, Haus 2, 10115, Berlin, Germany

3 Department of Physics, Humboldt University Berlin, Newtonstr. 15, 12489, Berlin, Germany

4 Institute for Neurobiology, University Tübingen, Tübingen, Germany

Published online: 18 April 2015

The correct formula for $n = 2$ replacing Eq. (51) in (Sharafi et al. 2013) reads:

$$S_{SO,SO}(f) = \frac{r_0^2\alpha^2}{2}\Bigg[4r_0(1+4D_s r_0)e^{-2\beta f^2} + \sqrt{\frac{\pi}{\beta}} \times \left(1 + 2r_0 D_s\left[1+\mathrm{erf}(2\sqrt{\beta}(f_c - f/2))\right]\right) e^{-\beta f^2}\Bigg], \qquad (51)$$

where $\beta = 2\pi^2\sigma^2$ and we also used that erf $(\sqrt{\beta}(2f_c + f)) \approx 1$ for $f \in (0, f_c)$ which is valid for $f_c \gg 1/(2\pi\sigma)$ as already assumed above.

For $n = 3$, Eq. (52) should be replaced by

$$S_{SO,SO}(f) = \alpha^2 r_0^3 \Bigg[3r_0^2\left[1 + D_s\left(6r_0 + 2\sqrt{\frac{2\pi}{\beta}}\right)\right]e^{-2\beta f^2} + \frac{3r_0}{2}\sqrt{\frac{\pi}{\beta}}\left(1 + 4D_s r_0\left[1 + \mathrm{erf}(2\sqrt{\beta}(f_c - f/2))\right]\right)e^{-\beta f^2} + \frac{\pi/2}{\sqrt{3}\beta}\left(1 + 3D_s r_0\left[1 + \mathrm{erf}(\sqrt{3\beta}(f_c - f/3))\right]\right)e^{-\frac{2}{3}\beta f^2}\Bigg]. \qquad (52)$$

We used the corrected formulas to recalculate our approximations for the power spectrum and coherence functions for the populations of Poisson neurons and of LIF neurons, respectively, and found virtually no difference to our previous results. It turned out that for the signal amplitudes used in our paper, the term in question only slightly affects the approximation of the power spectrum.

We also would like to emphasize that our qualitative explanation of information filtering by synchrony is based on the zeroth-order approximation of the power spectrum and thus is not affected at all by the modified correction term. Hence, all our conclusions drawn from the theory in (Sharafi et al. 2013) remain valid.

We would like to thank Alexandra Kruscha, Bernstein Center for Computational Neuroscience Berlin, for pointing out the error to us.

References

Sharafi, N., Benda, J., & Lindner, B. (2013). Information filtering by synchronous spikes in a neural population. *Journal of Computational Neuroscience*, *34*, 285.