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Extreme Quantum Advantage When Simulating Strongly Coupled Classical Systems (Corrigendum)

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This note corrects a typographical error in Eq. (18) of *Scientific Reports 7:1 (2017): 6735.* The originally published numerical results are correct, being based on the equation's correct form.

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Consider a block of spins of length $2N$, divided equally into two blocks. We denote spins in the left (L) and right (R) halves by: s_i^L and s_i^R for $i = 1, \ldots, N$, respectively. As a result the block is $s_1^L \cdots s_N^L s_1^R \cdots s_N^R$. We map the left and right half-block configurations each to an integer η_* by:

$$\eta_* = \sum_{i=1}^{N} \left(\frac{s_i^* + 1}{2} \right) 2^{i-1} \ , \tag{1}$$

where $*$ can be either L or R. Each block can have 2^N distinct configurations. Consequently, the label η_* varies between 0 and $2^N - 1$. The right eigenvector of V corresponding to the largest eigenvalue is denoted by u. Reference [1] shows that the conditional probabilities can be written as:

$$\Pr(\eta_R | \eta_L) = \frac{1}{\lambda} V_{\eta_L, \eta_R} \frac{u_{\eta_R}}{u_{\eta_L}} \ . \tag{2}$$

To obtain symbol-labeled transition matrices of the process' generator we need to recall that the left block is the "past"-generated configuration denoted $s_1^L \cdots s_N^L$ and the right block is the "future" configuration denoted by $s_1^R \cdots s_N^R$. For simplicity and consistency define the first future symbol to be generated by $x \equiv s_1^R$. As a result after the generation of this symbol the block with the last N past symbols would be $s_2^L \cdots s_N^L s_1^R$. The η corresponding to this new block is denoted η_{NL}. Consequently, to obtain the symbol-labeled transition matrices $T^{(x)}_{\eta_L, \eta_{NL}}$ we must sum over the symbols $s_2^R \cdots s_N^R$. As a result for any given past $s_1^L \cdots s_N^L$ and future generated symbol x we have:

$$T^{(x)}_{\eta_L, \eta_{NL}} = \begin{cases} \sum\limits_{s_2^R, \cdots, s_N^R} \frac{1}{\lambda} V_{\eta_L, \eta_R} \frac{u_{\eta_R}}{u_{\eta_L}}, & \eta_{NL} = \left(\lfloor \frac{\eta_L}{2} \rfloor + x(2^{N-1}) \right) \\ 0, & \text{otherwise} \end{cases} .$$

The original Eq. (18) should be replaced by that above.

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[1] Feldman, D.P. & Crutchfield, J.P. Discovering Noncritical Organization: Statistical mechanical, information theoretic, and computational views of patterns in simple one-dimensional spin systems. Santa Fe Institute Working Paper 98-04-026 (1998).