Corrigendum

Strong consistency and asymptotic efficiency for adaptive quantum estimation problems

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We have made an incorrect assertion in Section 6 regarding the achievability of the most informative Cramér-Rao bound. The correct value of the limit appeared on the sixth line of page 12501 is zero, which provides no information about the achievability of the bound. The fourth and fifth paragraphs in Section 6 thus need to be replaced with the following:

Let us investigate the operational meaning of this bound. The classical Cramér-Rao inequality asserts that

$$V_{\theta_0}[\hat{E}(\theta_0), \check{\theta}] \geq J(\theta_0|\hat{E}(\theta_0))^{-1}$$

for all estimator $\check{\theta}$ that is locally unbiased at θ_0, and the lower bound is attained by the estimator

$$\check{\theta}^i(\,\cdot\,) = \theta_0^i + \sum_j \left(J(\theta_0|\hat{E}(\theta_0))^{-1}\right)^{ij} \left(\frac{\partial}{\partial\theta^j} \log \mathrm{Tr}\, \rho_\theta \hat{E}(\theta_0)(\,\cdot\,)\right)_{\theta=\theta_0}.$$

Since $\hat{E}(\theta_0)(\,\cdot\,) = M(\,\cdot\,;\theta_0)$, we have

$$\mathrm{tr}\, G V_{\theta_0}[M(\,\cdot\,;\theta_0), \check{\theta}(\,\cdot\,;\theta_0)] = \min_{\check{\theta}:\,\text{LUE at } \theta_0} \mathrm{tr}\, G V_{\theta_0}[\hat{E}(\theta_0), \check{\theta}] = \mathrm{tr}\, G J(\theta_0|\hat{E}(\theta_0))^{-1}$$

and the asymptotic efficiency of the MLE (theorem 9) again establishes the achievability of the most informative Cramér-Rao bound by means of the adaptive estimation scheme.