Corrections to "On Transmit-Diversity for Spatial Modulation MIMO: Impact of Spatial-Constellation Diagram and Shaping Filters at the Transmitter"

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Abstract

In this comment, we correct some typographical errors in a paper that has recently appeared in this Transactions [1].

Index Terms

Multiple–Input–Multiple–Output Systems, Spatial Modulation, Transmit–Diversity, Single–Stream Decoding.

I. Introduction

In [1], the authors have proposed a new unified space–time–coded transceiver for Multiple–Input–Multiple–Output (MIMO) systems that exploits the recently proposed concept of Spatial Modulation (SM). Furthermore, the authors have introduced a Maximum–Likelihood (ML–) optimum single–stream demodulator for the proposed transmission scheme. In the present comment, we correct some typographical errors in some equations in [1, Sec. VI].

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A. Corrections to Section VI

The correct expression of [1, Eq. (15)] is as follows:

$$
\begin{aligned}
(\hat{\alpha},\hat{\mu}_1,\hat{\mu}_2) &= \underset{\mathbf{a}^{(\tilde{\alpha})}\in\mathcal{A},\ \tilde{\mu}_1\in\mathcal{M},\ \tilde{\mu}_2\in\mathcal{M}}{\arg\min} \left\{\Lambda_1\left(\tilde{\alpha},\tilde{\mu}_1\right)+\Lambda_2\left(\tilde{\alpha},\tilde{\mu}_2\right)\right\} \\
&\overset{(1)}{=} \begin{cases} \underset{\mathbf{a}^{(\tilde{\alpha})}\in\mathcal{A}}{\arg\min}\left\{\underset{\tilde{\mu}_1\in\mathcal{M},\ \tilde{\mu}_2\in\mathcal{M}}{\min}\left\{\Lambda_1\left(\tilde{\alpha},\tilde{\mu}_1\right)+\Lambda_2\left(\tilde{\alpha},\tilde{\mu}_2\right)\right\}\right\}\mapsto\hat{\alpha} \\ \underset{\tilde{\mu}_1\in\mathcal{M}}{\arg\min}\left\{\Lambda_1\left(\hat{\alpha},\tilde{\mu}_1\right)\right\}\mapsto\hat{\mu}_1 \\ \underset{\tilde{\mu}_2\in\mathcal{M}}{\arg\min}\left\{\Lambda_2\left(\hat{\alpha},\tilde{\mu}_2\right)\right\}\mapsto\hat{\mu}_2 \end{cases} \\
&\overset{(2)}{=} \begin{cases} \underset{\mathbf{a}^{(\tilde{\alpha})}\in\mathcal{A}}{\arg\min}\left\{\underset{\tilde{\mu}_1\in\mathcal{M}}{\min}\left\{\Lambda_1\left(\tilde{\alpha},\tilde{\mu}_1\right)\right\}+\underset{\tilde{\mu}_2\in\mathcal{M}}{\min}\left\{\Lambda_2\left(\tilde{\alpha},\tilde{\mu}_2\right)\right\}\right\}\mapsto\hat{\alpha} \\ \underset{\tilde{\mu}_1\in\mathcal{M}}{\arg\min}\left\{\Lambda_1\left(\hat{\alpha},\tilde{\mu}_1\right)\right\}\mapsto\hat{\mu}_1 \\ \underset{\tilde{\mu}_2\in\mathcal{M}}{\arg\min}\left\{\Lambda_2\left(\hat{\alpha},\tilde{\mu}_2\right)\right\}\mapsto\hat{\mu}_2 \end{cases}
\end{aligned} \tag{1}
$$

where (1) and (2) are described in [1]. The mistakes originated from typing $\arg\min\{\cdot\}$ instead of $\min\{\cdot\}$.

The correct expression of [1, Eq. (17)] is as follows:

$$
\hat{\alpha}=\underset{\mathbf{a}^{(\tilde{\alpha})}\in\mathcal{A}}{\arg\min}\left\{\Lambda_1\left(\tilde{\alpha},\hat{\mu}_1\left(\tilde{\alpha}\right)\right)+\Lambda_2\left(\tilde{\alpha},\hat{\mu}_2\left(\tilde{\alpha}\right)\right)\right\} \tag{2}
$$

The mistakes originated from typing $\hat{\mu}_i\left(\tilde{\alpha}\right)$ instead of $\Lambda_i\left(\tilde{\alpha},\hat{\mu}_i\left(\tilde{\alpha}\right)\right)$ for $i=1,2$.

The correct expression of [1, Eq. (19)] is as follows:

$$
\begin{cases} \hat{\mu}_m\left(\tilde{\alpha}\right)|_{m=1,2,\ldots,N_{\mathsf{M}}}=\underset{\tilde{\mu}_m\in\mathcal{M}}{\arg\min}\left\{\Lambda_m\left(\tilde{\alpha},\tilde{\mu}_m\right)=\sum_{r=1}^{N_r}\left[\left(E_S/2\right)\left(\sum_{\tau=1}^{N_{\tilde{\alpha}}}\left|\mathbf{H}_{r,\tilde{t}_\tau}\right|^2\right)|\tilde{\mu}_m|^2-2\sqrt{E_S/2}\mathrm{Re}\left\{\Psi_m^{(\mathrm{HX})}\left(\mathbf{t},\tilde{\mathbf{t}};r\right)\tilde{\mu}_m^*\right\}\right]\right\} \\ \hat{\alpha}=\underset{\mathbf{a}^{(\tilde{\alpha})}\in\mathcal{A}}{\arg\min}\left\{\sum_{m=1}^{N_{\mathsf{M}}}\Lambda_m\left(\tilde{\alpha},\hat{\mu}_m\left(\tilde{\alpha}\right)\right)\right\} \\ \hat{\mu}_m|_{m=1,2,\ldots,N_{\mathsf{M}}}=\hat{\mu}_m\left(\tilde{\alpha}=\hat{\alpha}\right)|_{m=1,2,\ldots,N_{\mathsf{M}}} \end{cases} \tag{3}
$$

which follows from the correct expression in (2).

II. Conclusion

In this comment, some typographical errors in [1] have been corrected. It is worth emphasizing that the numerical results in [1] are obtained by using the correct equations in (1)–(3).

References

[1] M. Di Renzo and H. Haas, "On transmit–diversity for spatial modulation MIMO: Impact of spatial–constellation diagram and shaping filters at the transmitter", *IEEE Trans. Veh. Technol.*, vol. 62, no. 6, pp. 2507–2531, July 2013.