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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:

$$\begin{aligned}
 (\hat{\alpha}, \hat{\mu}_1, \hat{\mu}_2) &= \arg \min_{\mathbf{a}^{(\tilde{\alpha})} \in \mathcal{A}, \tilde{\mu}_1 \in \mathcal{M}, \tilde{\mu}_2 \in \mathcal{M}} \{ \Lambda_1(\tilde{\alpha}, \tilde{\mu}_1) + \Lambda_2(\tilde{\alpha}, \tilde{\mu}_2) \} \\
 &\stackrel{(1)}{=} \left\{ \begin{array}{l} \arg \min_{\mathbf{a}^{(\tilde{\alpha})} \in \mathcal{A}} \left\{ \min_{\tilde{\mu}_1 \in \mathcal{M}, \tilde{\mu}_2 \in \mathcal{M}} \{ \Lambda_1(\tilde{\alpha}, \tilde{\mu}_1) + \Lambda_2(\tilde{\alpha}, \tilde{\mu}_2) \} \right\} \mapsto \hat{\alpha} \\ \arg \min_{\tilde{\mu}_1 \in \mathcal{M}} \{ \Lambda_1(\hat{\alpha}, \tilde{\mu}_1) \} \mapsto \hat{\mu}_1 \\ \arg \min_{\tilde{\mu}_2 \in \mathcal{M}} \{ \Lambda_2(\hat{\alpha}, \tilde{\mu}_2) \} \mapsto \hat{\mu}_2 \end{array} \right. \quad (1) \\
 &\stackrel{(2)}{=} \left\{ \begin{array}{l} \arg \min_{\mathbf{a}^{(\tilde{\alpha})} \in \mathcal{A}} \left\{ \min_{\tilde{\mu}_1 \in \mathcal{M}} \{ \Lambda_1(\tilde{\alpha}, \tilde{\mu}_1) \} + \min_{\tilde{\mu}_2 \in \mathcal{M}} \{ \Lambda_2(\tilde{\alpha}, \tilde{\mu}_2) \} \right\} \mapsto \hat{\alpha} \\ \arg \min_{\tilde{\mu}_1 \in \mathcal{M}} \{ \Lambda_1(\hat{\alpha}, \tilde{\mu}_1) \} \mapsto \hat{\mu}_1 \\ \arg \min_{\tilde{\mu}_2 \in \mathcal{M}} \{ \Lambda_2(\hat{\alpha}, \tilde{\mu}_2) \} \mapsto \hat{\mu}_2 \end{array} \right.
 \end{aligned}$$

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:

$$\hat{\alpha} = \arg \min_{\mathbf{a}^{(\tilde{\alpha})} \in \mathcal{A}} \{ \Lambda_1(\tilde{\alpha}, \hat{\mu}_1(\tilde{\alpha})) + \Lambda_2(\tilde{\alpha}, \hat{\mu}_2(\tilde{\alpha})) \} \quad (2)$$

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

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

$$\left\{ \begin{array}{l} \hat{\mu}_m(\tilde{\alpha})|_{m=1,2,\dots,N_M} = \arg \min_{\tilde{\mu}_m \in \mathcal{M}} \left\{ \Lambda_m(\tilde{\alpha}, \tilde{\mu}_m) = \sum_{r=1}^{N_r} \left[(E_S/2) \left(\sum_{\tau=1}^{N_{\tilde{\alpha}}} |\mathbf{H}_{r,\tilde{\tau}}|^2 \right) |\tilde{\mu}_m|^2 - 2\sqrt{E_S/2} \operatorname{Re} \left\{ \Psi_m^{(\text{HX})}(\mathbf{t}, \tilde{\mathbf{t}}; r) \tilde{\mu}_m^* \right\} \right] \right\} \\ \hat{\alpha} = \arg \min_{\mathbf{a}^{(\tilde{\alpha})} \in \mathcal{A}} \left\{ \sum_{m=1}^{N_M} \Lambda_m(\tilde{\alpha}, \hat{\mu}_m(\tilde{\alpha})) \right\} \\ \hat{\mu}_m|_{m=1,2,\dots,N_M} = \hat{\mu}_m(\tilde{\alpha} = \hat{\alpha})|_{m=1,2,\dots,N_M} \end{array} \right. \quad (3)$$

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.