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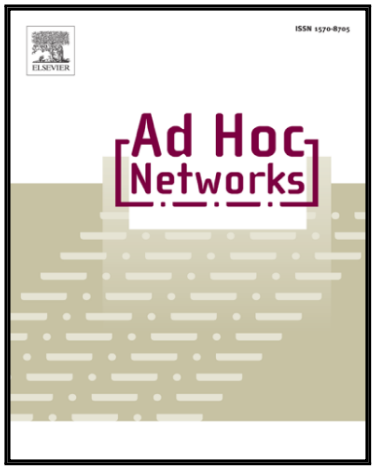

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Directional Modulation Design Under Maximum and Minimum Magnitude Constraints for Weight Coefficients☆

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Abstract

Directional modulation (DM) as a physical layer security technique has been studied widely to meet different design requirements, such as minimum spacing between adjacent antennas, and robust against steering vector errors. However, weight magnitude constraints in DM area have not been studied thoroughly. In this paper, the possibility of imposing various weight magnitude constraints is explored and simultaneous maximum and minimum magnitude constraints for weight coefficients are proposed in DM design for the first time. The proposed maximum magnitude constraint can avoid the use of multiple-stage power amplifiers, and the minimum magnitude constraint can make sure a minimum power requirement for each antenna is achieved so that a reasonable minimum transmission range of the system can be maintained by effectively using all employed antennas. Since the resultant problem is non-convex, a solution to transform it into a convex form is described, allowing the problem to be solved conveniently using existing convex optimisation toolboxes. Design examples are provided to show the effectiveness of the proposed design.

Keywords: Directional modulation, linear antenna array, maximum magnitude constraint, minimum magnitude constraint.

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