

ChannelAgent-Empowered Electromagnetic Space World Model: A Case Study on Agent-Driven Channel Generation for 6G AI-Native Air Interface

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Abstract

As sixth-generation (6G) wireless networks evolve toward increasingly heterogeneous scenarios, tasks, and service requirements, conventional artificial intelligence (AI) models remain limited in task-aware decision-making and autonomous adaptation. To address this issue, this paper first proposes a ChannelAgent-empowered electromagnetic space world model, in which wireless intelligence is organized into a closed-loop process consisting of multi-modal sensing, ChannelAgent as the intelligent core, and execution with feedback update. As a case study, agent-driven channel generation is instantiated through path loss prediction. Specifically, a task-oriented intelligent feature selection mechanism is designed by integrating reinforcement-learning-inspired policy adaptation with evolutionary search, enabling the agent to iteratively derive compact and task-suitable feature subsets according to the current scenario and performance feedback. Simulation results demonstrate superior performance in both single-scenario and multi-scenario tasks, highlighting the potential of the proposed model for autonomous, adaptive, task-oriented, and closed-loop wireless intelligence.

Note: Figure translations are in progress. See original paper for figures.

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