Low Complexity Message Passing Detection Algorithm for Large-Scale MIMO Systems

ABSTRACT

The original message passing detection (MPD) algorithm, which exploits channel hardening theory, achieves very good performance in large-scale Multi-Input Multi-Output (MIMO) systems. However, the complexity of the MPD algorithm grows rapidly when the number of users or the order of modulation increases, presenting a great implementation challenge for practical massive MIMO systems. In this letter, based on a novel approximate probability updating (APU) scheme, a low complexity MPD (LCMPD) algorithm is proposed. The developed APU scheme considers only the most reliable constellation point during the message passing process. Combined with a serial message updating schedule, no exponential operation or division is required in the LCMPD algorithm. Compared to the existing MPD algorithm, the overall computational complexity is reduced by 11.2 to 29.4 times under various antenna configurations with almost no degradation in the bit error rate performance. Hence, the proposed algorithm is very suitable for efficient hardware implementation.

EXISTING SYSTEM

- In existing system, MPD algorithm the MPD algorithm is matrix-inverse free and can achieve better performance than MMSE detector, making it very attractive for signal detection.
- However, the MPD algorithm contains lots of exponential computations.
- The MPD algorithm based on the message passing on graphical models is a promising approach used in largescale MIMO systems

PROPOSED SYSTEM

- The scheme aims to further reduce the complexity of the system by decreasing the number of sortings and iterations.
- A serial message updating schedule which employs the most up to date probabilities is developed in this work, leading to faster convergence rate compared to the MPD algorithm.
- Therefore the LCMPD algorithm can greatly reduce the computational complexity of the original MPD.

SYSTEM REQUIREMENTS

HARDWARE REQUIREMENTS

- •Processor Intel core i3
- •RAM 2B
- •Hard Disk 20 GB

SOFTWARE REQUIREMENTS

- •Operating System : LINUX
- •Tool : Network Simulator-2
- •Front End : OTCL (Object Oriented Tool Command Language)

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