

다중 채널 액세스 시스템의 사용자간 동일 전송율 보장을 위한 분산환경 강화학습 기법 연구

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Distributed Reinforcement Learning for Enhancing Throughput and Fairness of Multichannel Access Systems

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요약

We consider a multichannel random access system in which each user, arriving in the system randomly and remaining activated for a certain duration, accesses a single channel at each time slot to communicate with an access point. Under such dynamic network environment, we propose a distributed multichannel access protocol based on multi-agent reinforcement learning (RL) to improve both throughput and fairness between active users. We perform extensive simulations on realistic traffic environments and demonstrate that the proposed online learning improves both throughput and fairness compared to the conventional RL approaches and centralized scheduling policies.

I. 서론

In order to satisfy soaring data demands random access has been considered as a promising solution for efficiently sharing wireless resource [1]. Recently, Reinforcement learning (RL) algorithms have been applied for multichannel access problems in order to provide an enhanced throughput [2]. In this paper, we propose a multi-agent distributed multichannel access policy guaranteeing fair multichannel access between active users.

II. 본론

We consider a wireless communication system in which an access point (AP) is located at the center of a cell and serves users in the cell using N orthogonal resource blocks (RBs). In our proposed multichannel access policy, each active user will determine its transmission policy for multiple consecutive time slots. For convenience, we introduce ‘decision times’ to represent certain time slots for such decision. For each decision time, an RL agent of each user takes its action from the current state information and the corresponding reward will be given. We propose a vectorized deep Q-network architecture and the corresponding training methodology to efficiently

estimate the Q-value of each action with low complexity.

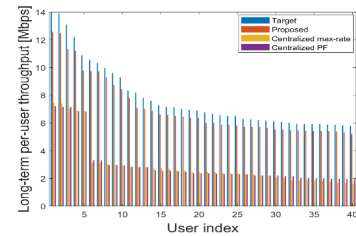


Fig. 1: Average per-user throughputs.

Fig. 1 plots average per-user throughput of the proposed scheme along with two centralized schedulers. As seen in the figure, the proposed scheme provides both throughput and fairness improvement and outperforms both centralized schedulers.

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참고문헌

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