Dynamic Resource Allocation for RAN Slicing Using a CNN-A2C Algorithm

Awoke Loret Abiy, Seong Ho Jeong
Hankuk University of Foreign Studies
loretabiy@hufs.ac.kr, shjeong@hufs.ac.kr

CNN-A2C 알고리즘을 이용한 RAN 슬라이싱을 위한 동적 자원 할당

로렛, 정성호
한국외국어대학교

Abstract

Dynamic Resource Allocation is a crucial component of RAN Slicing. Previous studies have shown that s result in promising resource allocation decisions. However, optimal resource allocation decisions are yet to be improved. This paper proposes a CNN-A2C algorithm to allocate bandwidth to network slices by ensuring a service level agreement and spectral efficiency. Simulation results have shown a significant improvement in spectral efficiency.

Ⅰ. Introduction

In recent years, deep reinforcement learning (DRL) has emerged as a prevalent approach for network slice resource management and has shown promising results [1]. However, a common limitation in existing research is the lack of consideration for an adequate range of features within the state space, which is of great importance for the agent to learn optimal policies. It has been shown that CNNs can be used to automatically extract features from time series leading to superior feature representations [2]. CNNs can unveil latent features, providing an extensive range of features within the state space. This paper proposes to use the popular DRL algorithm A2C along with CNN for resource allocation for network slices.

Ⅱ. Method

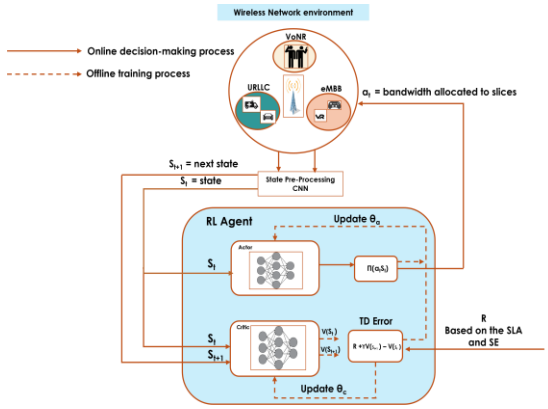

Fig. 1: CNN-A2C based resource allocation for RAN slices

The number of packets arriving at each network slice over 10 consecutive time steps is an input to the CNN. The output from the CNN forms the state of the environment. The action is the bandwidth allocated to the slices based on the optimal policy. The reward is a function of the SLA and the QoE.

Ⅲ. Simulation Result

As shown in Fig. 2, the CNN-A2C algorithm shows a relatively more stable spectral efficiency (SE) after the 2000th step as compared to the A2C-LSTM algorithm.

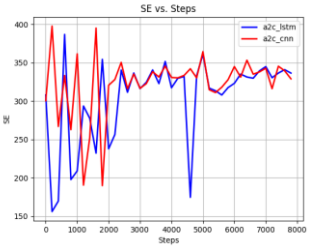

Fig. 2: SE vs Iteration Comparison between A2C-CNN and A2C-LSTM

IV. Conclusion

This paper has shown that CNN-A2C is useful for improving the spectral efficiency when allocating bandwidth to network slices.

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