RESEARCH OF 5G HUDN NETWORK SELECTION ALGORITHM BASED ON DUELING-DDQN.

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Abstract.

Due to the dense deployment and the diversity of user service types in the 5G HUDN environment, a more fexible network selection algorithm is required to reduce the network blocking rate and improve the user's quality of service (QoS). Considering the QoS requirements and preferences of the users, a network selection algorithm based on Dueling-DDQN is proposed by using deep reinforcement learning. Firstly, the state, action space and reward function of the user- selected network are designed. Then, by calculating the network selection benefits for diferent types of services initiated by users, the analytic hierarchy process is used to establish the weight relationship between the diferent user services and the network attributes. Finally, a deep Q neural network is used to solve and optimize the proposed target and obtain the user's best network selection strategy and long term network selection benefits. The simulation results show that compared with other algorithms, the proposed algorithm can effectively reduce the network blocking rate while reducing the switching time.

Keywords: 5G heterogeneous ultra-dense network, Deep reinforcement learning, QoS, Network selection, Dueling-DDQN.

Methods.

In order to solve the network selection problem in 5G heterogeneous ultra dense network (HUDN) environment, a network selection algorithm based on Dueling Double Deep Q Network (DDQN) is proposed. Te deep reinforcement learning (DRL) method was introduced to model and execute the algorithm, and its applicability was verified in the coexistence environment of multiple networks such as wireless local area network (WLAN), long time evolution (LTE), and 5G. We designed the state, action space, andreward function of the user selection network. We calculated the network selection benefts for diferent types of services initiated by the user, and established the weight relationship between the user's diferent services and network attributes using analytic hierarchy process (AHP). Finally, we used a deep Q neural network to solve and optimize the proposed goal, obtaining the user's optimal network selection strategy and longterm network selection benefts. Compared with other intelligent algorithms, the proposed network selection algoritm effectively reduces the number of switches and improves the efciency of network resource utilization.

System model. In order to differentiate from previous studies on het rogeneous network selection, the network density of the studied network selection problem is highlighted. The system model in this paper not only increases the type and number of networks, but also adds the number of networks. The consideration of 5G new business, so as to refect the general scenario of multiple services and multiple networks, has certain extensibility and versatility. Th HUDN considered is composed of LTE macro base stations, wireless local area networks and 5G micro base stations, as shown in Fig.1. Among them, macro-base stations provide users with wide area network services, micro-base stations provide users with small-scale and high quality network services, and WLANs provide users with low cost network services. The wireless access network adopts orthogonal frequency division multiplexing (OFDM) technology. All networks are unife and converged to access the core to allow users to access the internet. User candidate networks are represented as the set N = {n1, n2, n3, ...ni, ..nn}, where is the candidate network. Each network in the system has five network attributes, is bandwidth (B), delay (D), jitter (J), price (E), and packet loss (P). The user terminal business considers 5G Communication under the new business, such as 4k Ultra HD video, industrial remote control, telecommuting, smart home, and so on. These business information fows are divided into three categories, namely eMBB, URLLC, and mMTC. At the same time, the key performance indicators (KPIs) of these three types of new services are similar to traditional user service KPIs, mainly including bandwidth, delay, jitter, and price. For example, the eMBB scenario mainly meets the needs of future-oriented mobile Internet services. Its typical application, 4K ultra-clear video call, as an example, requires a bandwidth of at least 75Mbps and a delay of less than 100 ms. The URLLC service needs to meet the requirements of low latency and high reliability. Taking the typical remote control application as an example, it needs at least 50 ms delay to make th reliability reach 99.99%, and some key services need less than 30 ms delay and at least 10Mbps bandwidth.

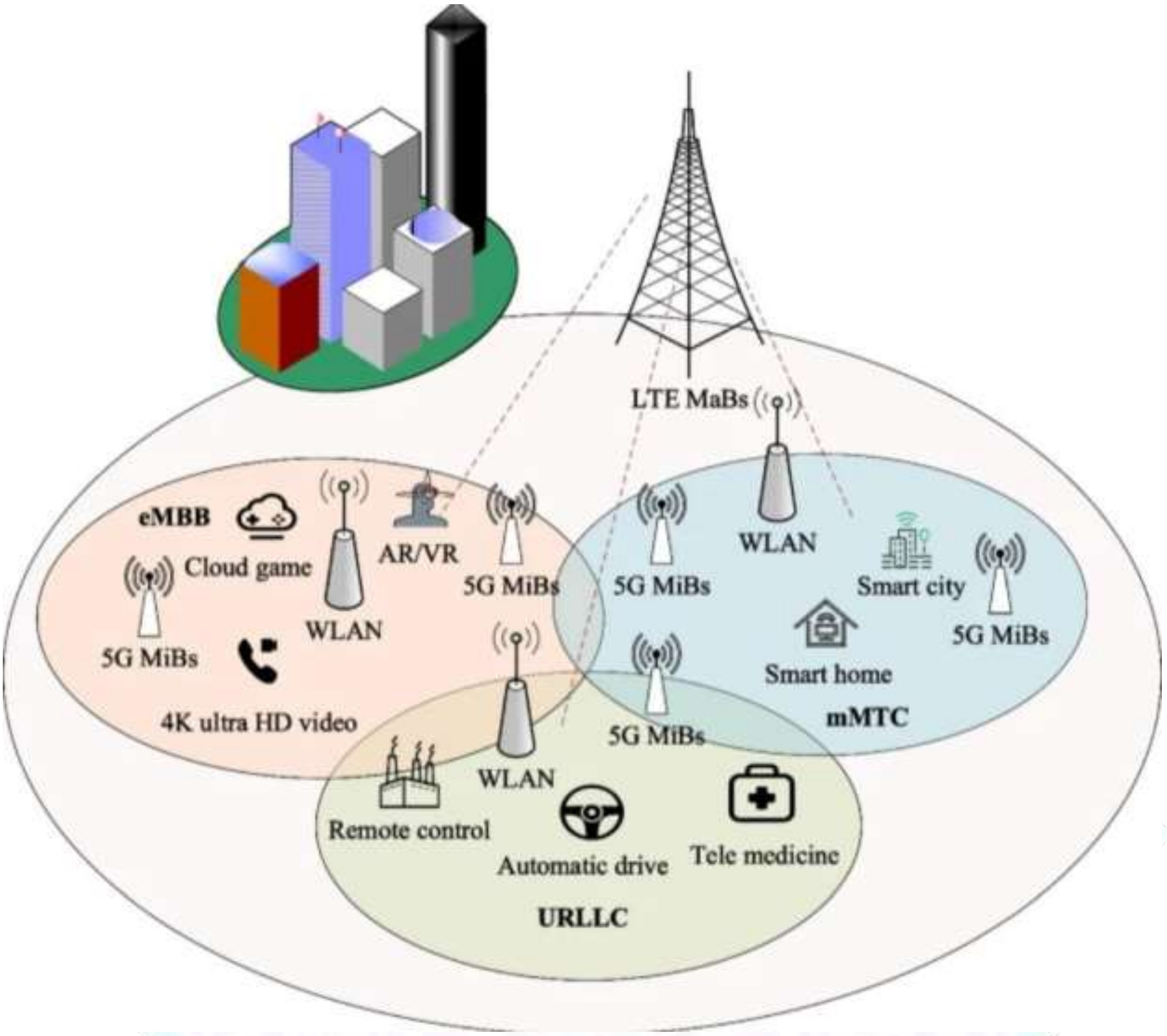

Fig.1. System model.

The mMTC scenario aims to reliable connections for devices with low power consumption, low cost, and small data packets. Taking its typical application of smart home as an example, it has low tolerance for price and packet loss rate.

List of used literature.

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