

A New Task Offloading Algorithm in Edge Computing

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Research

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Abstract

In the last few years, the Internet of Things (IOT), as a new disruptive technology, has gradually changed the world. With the prosperous development of the mobile Internet and the rapid growth of the Internet of Things, various new applications continue to emerge, such as mobile payment, face recognition, wearable devices, driverless, VR/AR, etc. Although the computing power of mobile terminals is getting higher and the traditional cloud computing model has higher computing power, it is often accompanied by higher latency and cannot meet the needs of users. In order to reduce user delay to improve user experience, and at the same time reduce network load to a certain extent, edge computing, as an application of IOT, came into being. In view of the new architecture after dating edge computing, this paper focuses on the task offloading in edge computing, from task migration in multi-user scenarios and edge server resource management expansion, and proposes a multi-agent load balancing distribution based on deep reinforcement learning DTOMALB, a distributed task allocation algorithm, can perform a reasonable offload method for this scenario to improve user experience and balance resource utilization. Simulations show that the algorithm has a certain adaptability compared to the traditional algorithm in the scenario of multi-user single cell, and reduces the complexity of the algorithm compared to the centralized algorithm, and reduces the average response delay of the overall user. And balance the load of each edge computing server, improve the robustness and scalability of the system.

Full Text

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Figures

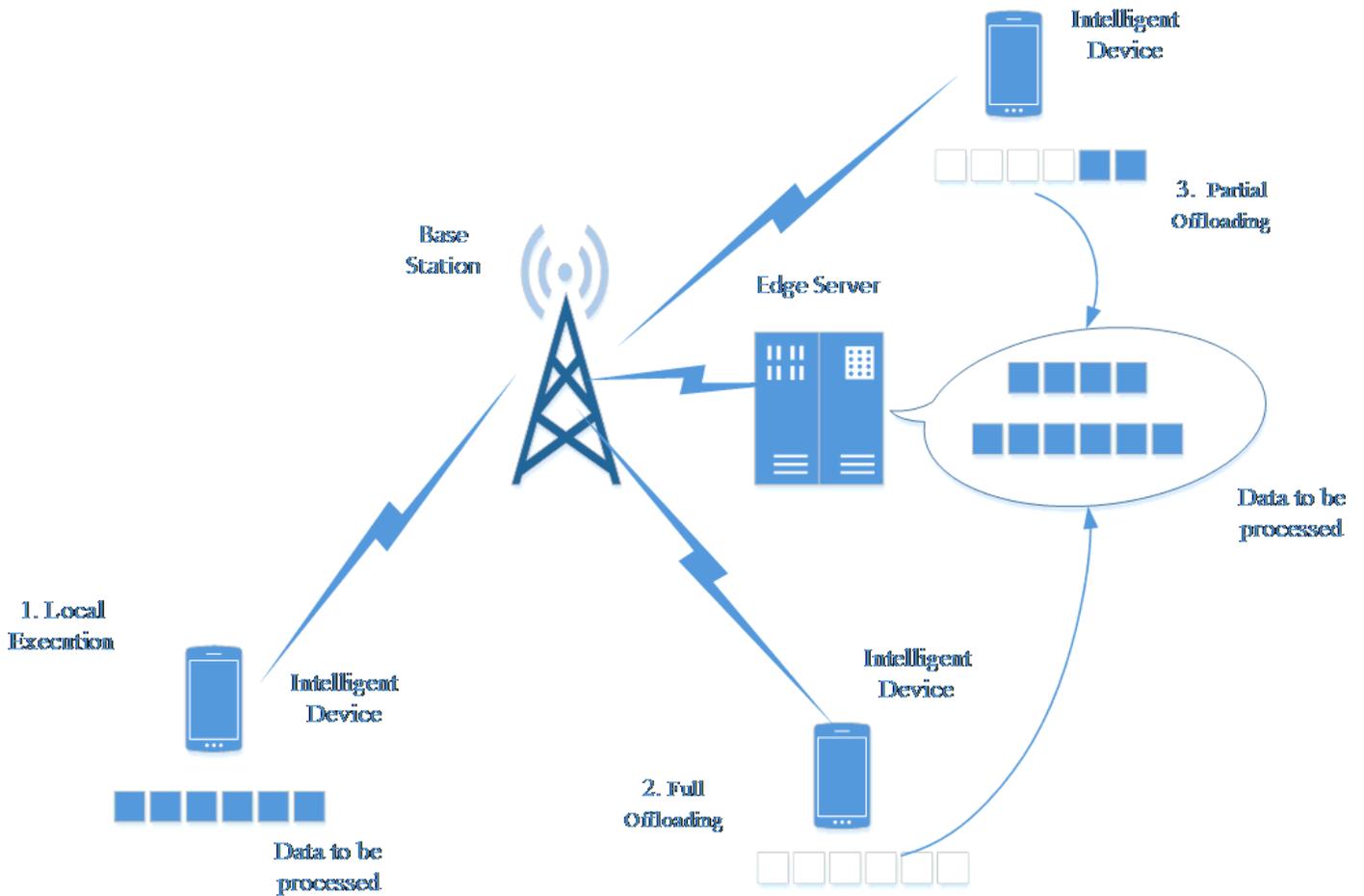


Figure 1

The possible decisions to calculate the offload may have three situations, local execution, full offloading and partial offloading.

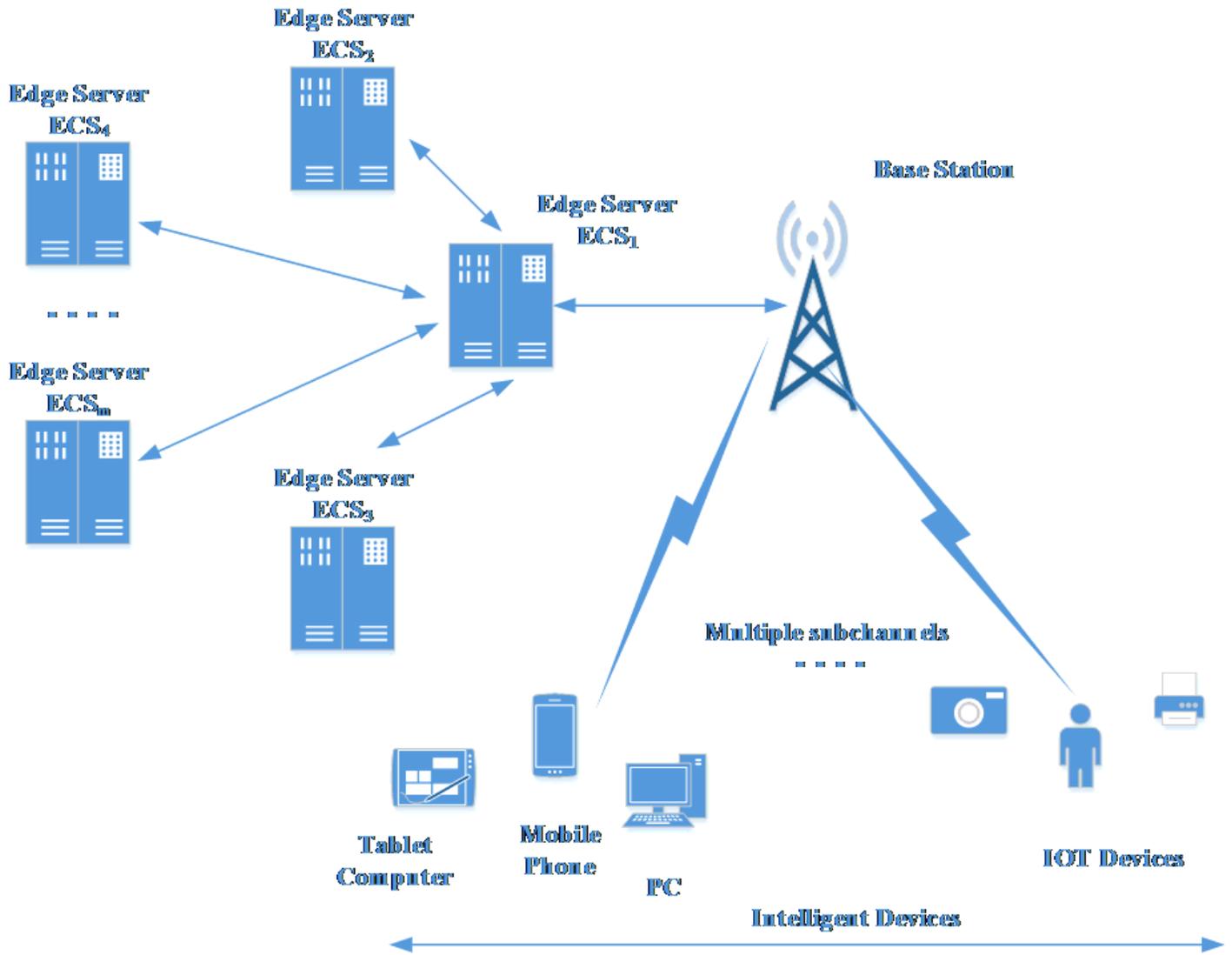


Figure 2

In a single-cell multi-user scenario, the base station can be divided into multiple sub-channels for different users. At the same time, the base station is connected to multiple edge servers to provide users with computing resources to help them process computing tasks.

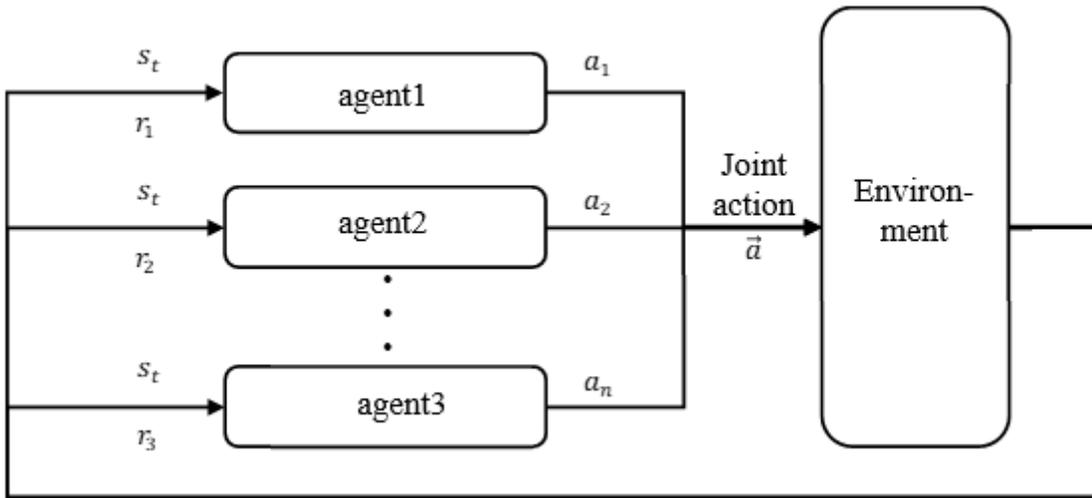


Figure 3

Multi-agents act at the same time, and under joint action, the entire system will be transferred, and each agent will be rewarded immediately.

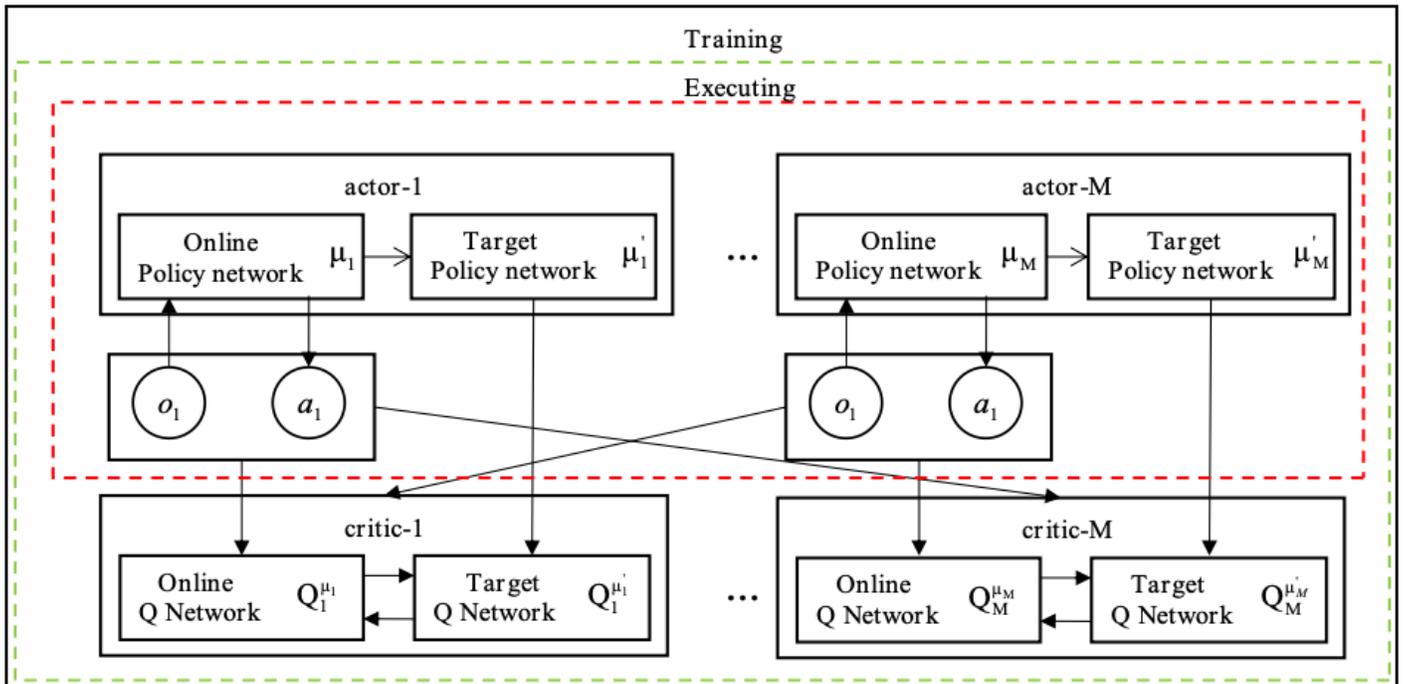


Figure 4

How the distributed task offloading algorithm based on multi-agent and load balancing works.

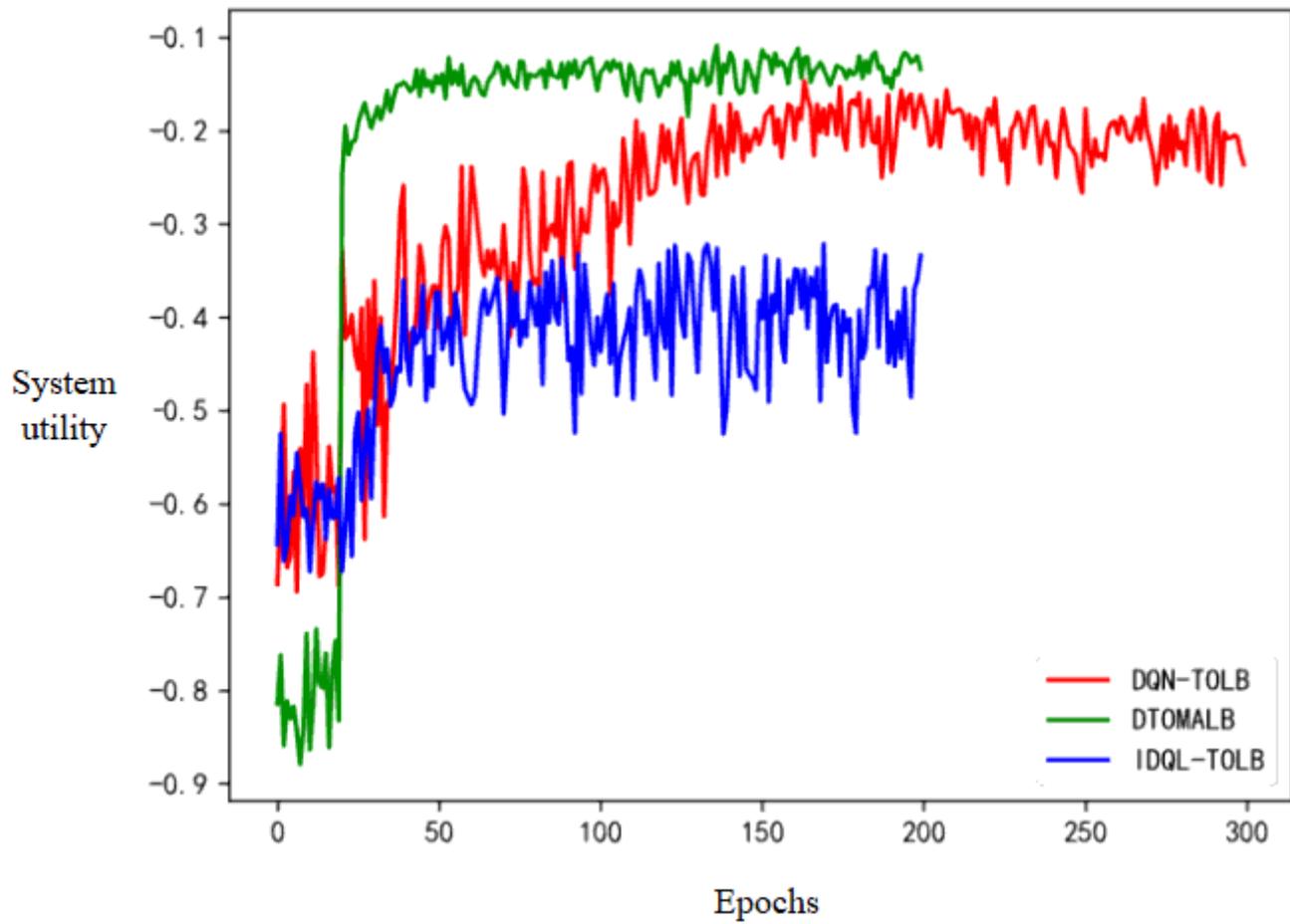


Figure 5

Compare the convergence of the DQN-TOLB and IDQL-TOLB algorithms with the centralized DQN-TOLB algorithm.

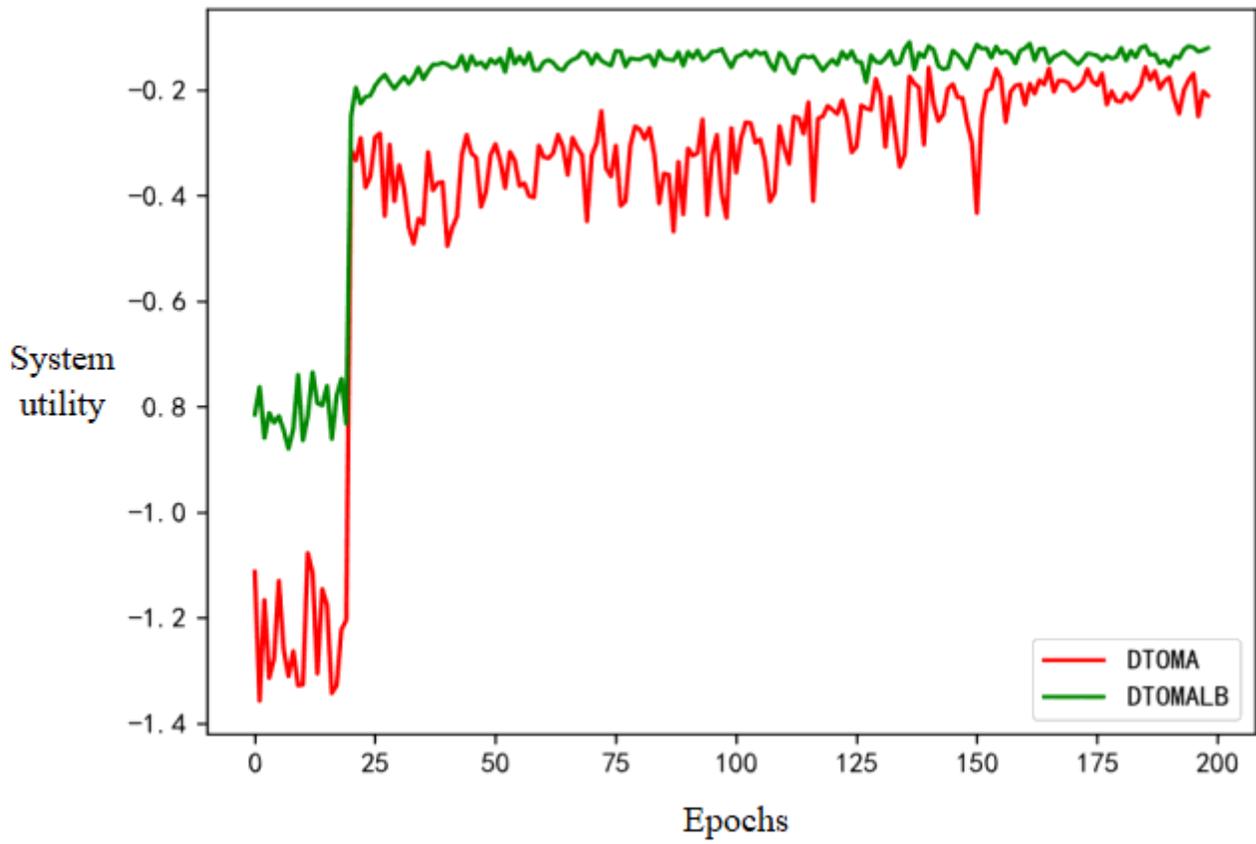


Figure 6

A comparison of the training situation of the DTOMALB algorithm and the DTOMA algorithm without the introduction of load balancing coefficients..

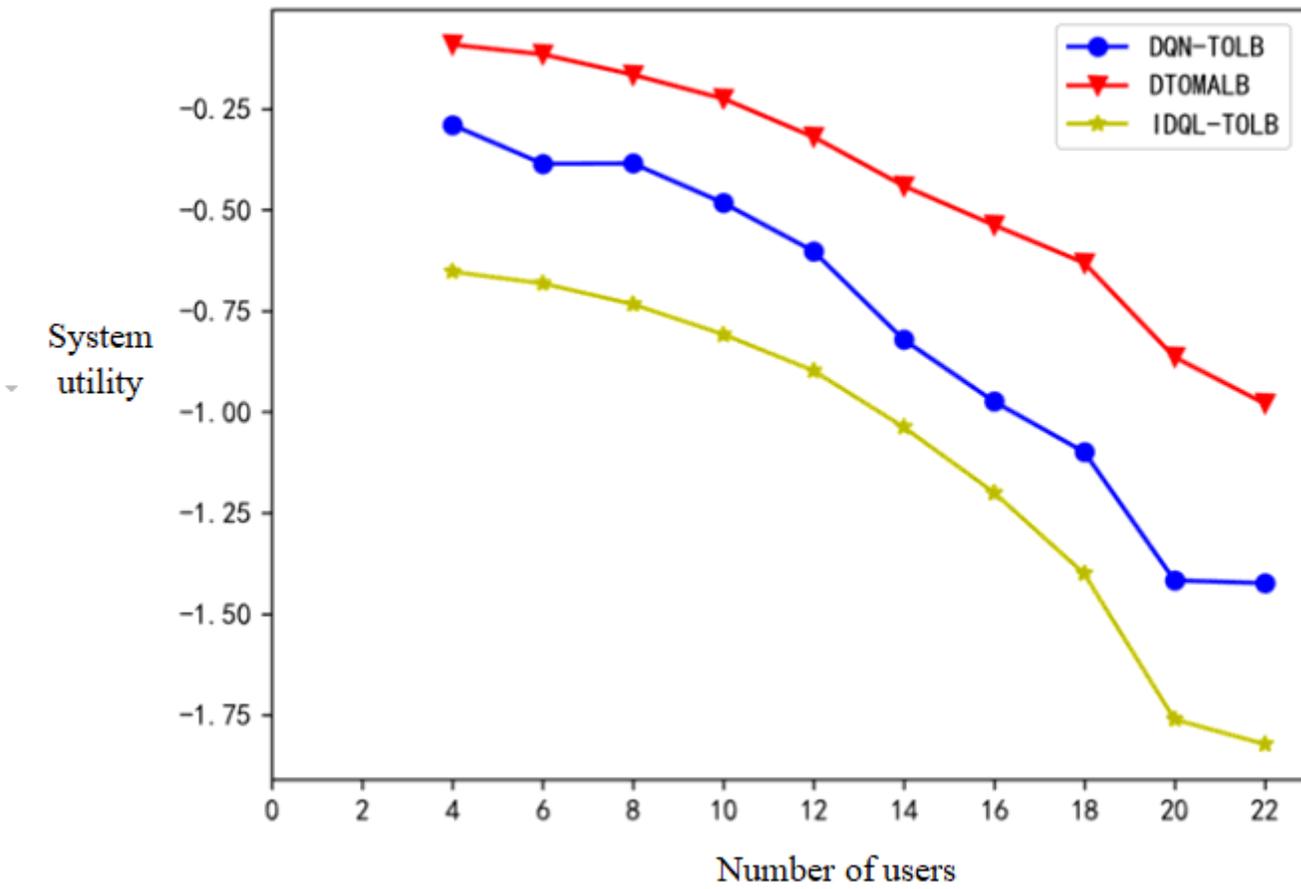


Figure 7

The superiority of the algorithm is reflected because the overall utility of the resource scheduling scheme based on DTOMALB is higher.

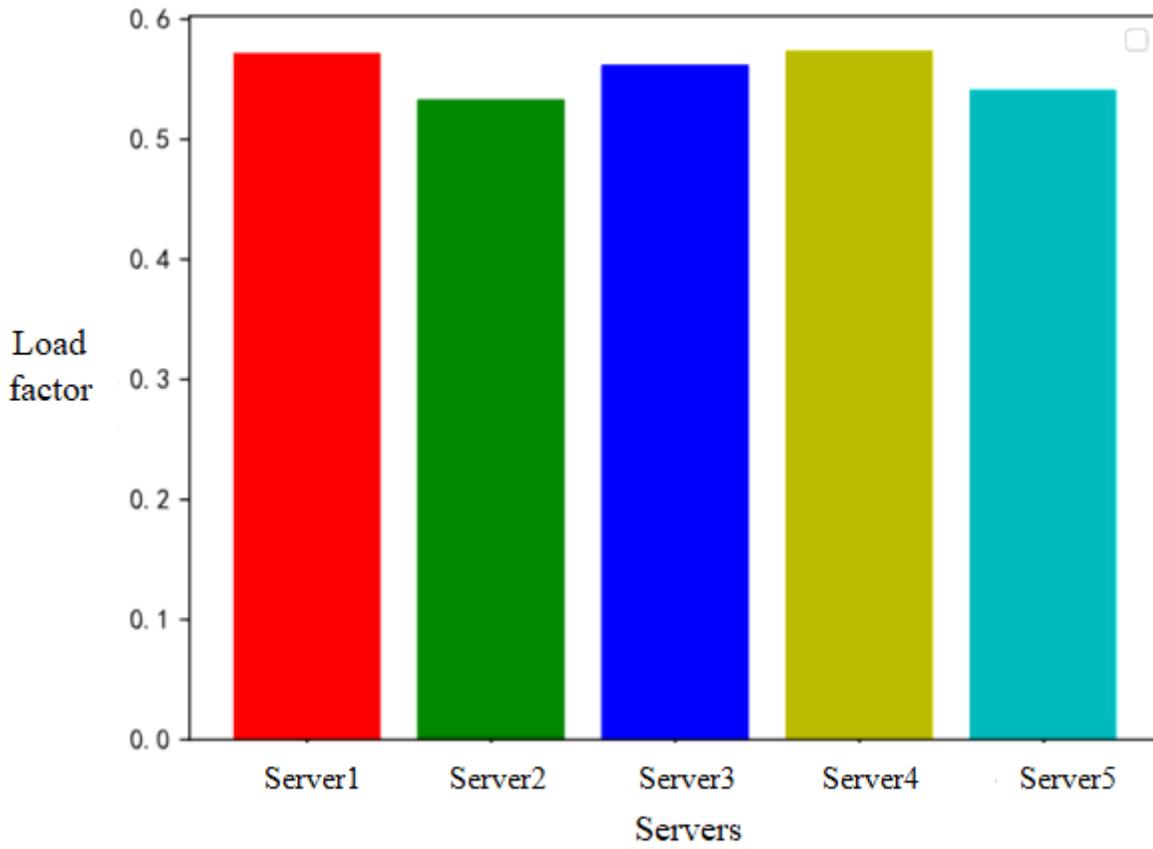


Figure 8

The load factor of each server is almost the same, and the load balancing is realized by the DTOMALB algorithm.