ABTRACT

The rise in mobile users has increased demand for proximity services with high data rates. A roadmap for dependable and resource-efficient solutions is provided by the fifth generation (5G) of wireless networks, which promises to enhance current technology in accordance with future demands. In order to enable capabilities like live video and data sharing, device-to-device (D2D) communication has been conceptualized as an associated technology of 5G wireless systems. The possibility for device-centric communications utilizing the D2D communication approach is increased by using direct D2D links rather than only cellular links. Offloading traffic from traditional network-centric entities to a D2D network increases network capacity and reduces base station processing. Direct communication between devices improves spectrum efficiency but has drawbacks as well, such as interference. Using the spectrum effectively while reducing the effects of interference could be made possible through intelligent resource allocation algorithms. Furthermore, routing is essential to any wireless network because it allows for path selection, which offers the most efficient way to authorize the data to be transmitted from a source to a target device. Inefficient routing can lead to route flapping and lower overall Quality of Service (QoS). D2D is a technology that, in the meantime, enables connections between the devices with or without full or partial use of the traditional cellular network. Hence, this research introduces two various contributions for the D2D communication like resource allocation and efficient routing strategies. The first contribution is the joint channel allocation and relay selection using the Enhanced Hunter prey Optimization and deep reinforcement learning (EnHpo+DRL). In this initially, the channel allocation technique is proposed using the enhanced hunter prey optimization (EnHpo) algorithm. The proposed EnHpo is designed by integrating the conventional hunter prey optimization with the adaptive weighting strategy for enhancing the convergence rate and obtaining the global best solution with balanced randomization and local search phases. Here, the multi-objective fitness function based on factors like priority, bandwidth and transmission rate are considered for the optimal channel allocation. Followed by, the relay selection is devised using the deep reinforcement learning criteria based on the channel gain based on the bit error rate. Here, the relay sub-set selection in the using the deep reinforcement learning enhances the efficiency of D2D communication. The second

contribution is the relay based multi-hop routing for the energy efficient D2D communication. Here, the double deep Q learning technique is proposed for discovering the potential paths in this takes into account the energy consumption. Then, the Gannet Chimp optimization (GCO) algorithm is introduced for the selection of optimal path by considering the fitness function based on multi-objective factors for enhancing the performance of the model. The assessment of the D2D communication protocols are evaluated based on various assessment measures like Average Residual Energy, Latency, Network Life Time, Packet Delivery Ratio, and Throughput and accomplished superior outcome.

Keywords: ***5G wireless networks, Device-to-device (D2D) communication, Quality of Service (QoS), Enhanced Hunter Prey Optimization (EnHpo), Energy efficiency Resource allocation algorithms, Throughput.***