Quantum-inspired improved African vultures optimization algorithm for efficient placement of IoT service in edge computing environment: a supplementary report

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The emergence of 5G networks has led to development of Edge Computing (EC) environments, which offer improved support for applications that rely on the Internet of Things (IoT). However, Edge Nodes (ENs) have limited resources and heterogeneous IoT applications require changing resource requirements, making it difficult to integrate IoT services. During IoT service installation, ensuring QoS performance is also difficult. In this paper, Quantum-inspired Improved African Vultures Optimization Algorithm for Service Placement (QIAVOA-SP) is proposed for achieving efficient positioning of IoT service in EC environment. This QIAVOA-SP utilized the factors of computation load, delay, energy consumption and throughput during optimization such that necessitated service placement is achieved in EC. It formulated and evaluated the fitness function determined using parameters of load balancing, energy consumption, delay and throughput for optimal positioning of IoT services in EC scenario. It incorporated the concept of Quantum-inspired Improved African Vultures (QIAV) as search agents for representing the complex solutions that are essential for placing IoT services in an edge environment. It further used the technique of double hashing for decoding the QIAV, and further incorporated the Taguchi method for studying the parameters of impact. The simulation result of QIAVOA-SP approach confirmed 19.32% better load balancing, 18.98% reduced delay and 16.45% better energy consumption than baseline approaches used for investigation. The statistical analysis of this QIAVOA-SP approach conducted using Friedman test also confirmed its efficacy over the benchmarked approaches.

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