Optimization Algorithm Inspired by Artificial Bee Colonies to Improve Wireless Network Routing

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Abstract:

It may be possible to boost the capacity of wireless multi-channel networks by using an AI algorithm. Reducing interference could potentially improve network performance. This approach is divided into three phases: modeling the wireless environment comes first; performance is next optimized with the right tools; and finally, routing is enhanced by selecting performance criteria with care. An artificial bee colony optimization method with evaluation characteristics is used to improve wireless network connectivity. This method makes distributed routing decisions in synchrony by utilizing the simple behaviors of bee agents. The advantages of this method are amply demonstrated by the MATLAB simulations. The nature-inspired routing method has significantly better performance than the state-of-the-art models currently in use. Even a very simple

Keywords:

Synonyms: wireless networks, throughput, routing, AI, and robotic hive

Introduction

Due to the widespread usage of mobile and portable devices, wireless networks are becoming a crucial part of all communication systems [1]. More network capacity is required due to the growing demands on the network's resources. Applying effective algorithms and protocols is necessary to increase a wireless network's capacity. The throughput of wireless networks may be boosted by employing these techniques. Multiple nodes in a wireless network handle data transmission and reception [2]. Network protocols need to be carefully considered in order to guarantee efficient and timely data transmission to the network nodes. These protocols are necessary for a wireless network to function properly. To support the characteristics and cognitive properties of individual nodes, better strategies and plans are required. Being aware of the

Contents and Plans

Flexibility in wireless routing is optimised by using AI principles to increase network performance. One of the greatest benefits of wireless networks is the ease with which data may be sent across great distances [7]. To maximise network efficiency, data transmission paths are optimally selected between sender and recipient. If a data packet's intended path is congested, the next shortest path is taken. However, there are certain limitations to wireless networks, such as interference. In this configuration, several nodes in the network share the same channel and bandwidth. As a consequence of this interference, the throughput of the network as a whole suffers. Diverse factors and their performance values altering in a systematic way, as well as the vast operating environment coverage range [11], motivate the construction of certain scenarios. The method may be conceived via brain storming to include the three broad areas of network engineering: quantum traffic engineering, hybrid traffic engineering, and practical applications. When better statistical performance values are sought after over numerous tries, quantum traffic engineering may be employed to provide repeatable abstraction patterns [12]. The estimated performance numbers are the mean of five experiments. The average values obtained do away with the randomness introduced by the method. The suggested method handles multimedia traffic in several ways, including the usage of the G.711 codec, concurrent Voice over IP

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sessions [13], and one sample per packet. It has been determined that a connection speed of about 64 kbps is necessary for the functioning of a Voice over IP session.

The suggested method is effective in meeting all criteria, including the delivery of packets with the specified latency and jitter. Current experiments with simulating and implementing comparable concepts are exciting. The present experiment makes advantage of the available software and hardware resources to run the realisable optimised artificial bee colony method on a core 2 duo CPU. Numerous beneficial results have been obtained from applying this technique in real-world network environments. This technique can also be applied to large-scale network architectures. The gathered data is converted into useful insights through the application of data science. After analyzing the data, a number of machine learning, deep learning, and other AI algorithms forecast the future using what they have discovered. In a multitude of wireless communication domains, learning mechanisms inside the environment of a wireless network provide intelligent capabilities and context awareness. Because these algorithms can increase network speed and quality of service, they are commonly employed.

These algorithms' clever behavior allows them to adjust to the complex, ever-changing wireless surroundings. By adding automation capabilities to wireless networks, it is possible to

Dissertations and Outcomes

Here, inferences from experimental results are discussed. Review is given to both the simulation results and the results of using the method on real-time networks. To guarantee the effectiveness of the technique, a new structure has been created. MATLAB is used for both model implementation and validation. MATLAB deduces similar patterns and results on the chosen methodologies from these traffic pattern data. Pattern development on physical devices running other operating systems is contrasted with pattern creation on virtual computers running Linux, all while utilizing various real-world networks. Simultaneous virtual concept tracking of similarity is made possible by an optimization network protocol inspired by artificial bee colonies and operating in real time. A large number of real-world networks have been set up for experimentation. When these conditions are met, clever routing techniques are

Experiments in Network Traffic Learning

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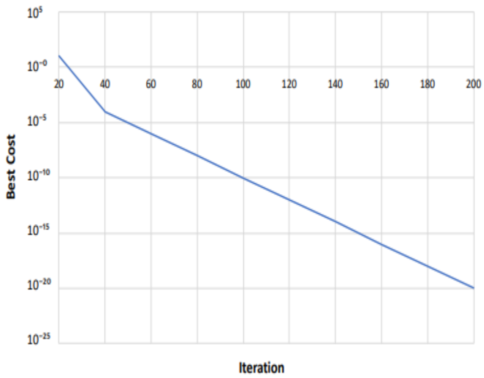

Figure 1: Simulation for 200 iterations

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The simulation's findings demonstrate that as the number of simulated iterations increases, so does the number of delivered packets. Through the use of the information gathered from the wireless network, the routing algorithm gradually becomes more efficient. Due to the queueing function, some packets go over the network more slowly than others. That being said, this latency differs significantly between simulation sessions as well as between real-world networks. While the wireless physical layer manages transmission modes, forward error correction, coding, bit-by-bit delivery, and modulation, it also keeps an eye on the bits, signals, and physical medium. In a number of situations, artificial neural networks (ANN) can be utilized to increase the wireless physical layer's efficiency. When information regarding

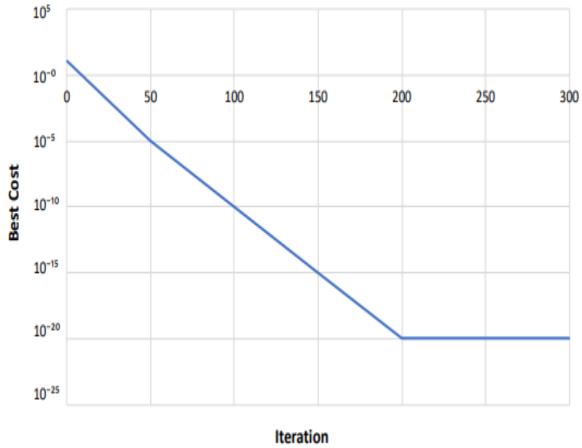
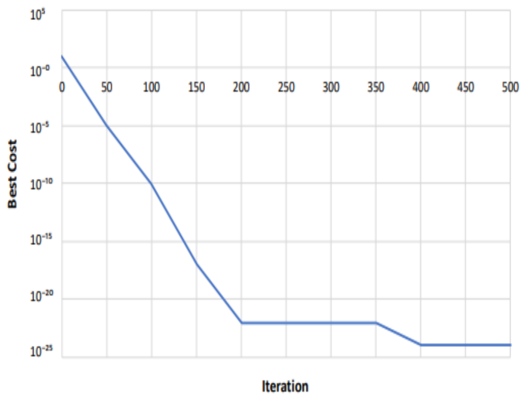


Figure 2: Simulation for 300 iterations

The "weight" or "connection strength" between any two neurons may fluctuate over a given length of time since each spiking neuron in SNN has a time-varying activation value. Depression and potentiation, respectively, are the terms used to describe SNN's depiction of weight gain or decrease. Depending on how long it takes for the consequences of a modification to manifest, it is classified as "long term" or "short term." There are four primary classifications based on how long a person experiences the consequences of a weight shift: long-term depression (LTD), short-term potentiation (STP), long-term depression (STD), and long-term potentiation (LTP). Neurobiological investigations frequently establish that the strength of connections between spiking neurons is influenced by the timing of the



spikes. In-depth

Figure 3: Simulation for 500 iterations

Conclusion

The technical and scientific achievements of this study are highlighted in a lengthy conclusion. The wireless system uses natural engineering and prioritizes knowledge and intelligent routers. An artificial bee colony-inspired optimization technique is used to analyze the properties of wireless networks. In reaction to technological competition, a variety of commercial items may employ this type of algorithm.

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The algorithm was inspired by the efficiency and organization of honey bee colonies. Bee agents' straightforward evaluation and communication techniques served as the model for this investigation. This algorithm can be used to make decentralized and asynchronous routing decisions. The results of the extensive MATLAB simulations demonstrate that the recommended method certainty. This method finds all multiple pathways with a total distance greater than a given threshold. This technique achieves higher performance by randomly sending data packets along various channels. Future research will focus on concurrently finding various pathways with different threshold levels using the routing method, bringing together the best of both stochastic and deterministic approaches.

Citations

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