International Journal of Applied Evolutionary Computation
Volume 10 • Issue 1 • January-March 2019

Nature Inspired Computing for Wireless Networks Applications: A Survey

Daneshwari I. Hatti, BLDEA V.P. Dr. P.G. Halakatti College of Engineering and Technology, Vijayapur, India

Ashok V. Sutagundar, Basveshwar Engineering College, Bagalkot, India

ABSTRACT

Nature inspired computing (NIC) is a computing paradigm inspired by the attractive behavior of nature. NIC has influenced the researchers to perform optimization in many approaches using physics/chemistry-based algorithms and biology-based algorithms. Physics/chemistry-based algorithms include the water cycle, a galaxy base, or gravitational-based algorithms. Biology-based algorithms, namely bio-inspired and swarm intelligence-related algorithms are discussed with their importance in the field of wireless networks. A wireless network such as MANET's, VANET, AdHoc, and IoT are playing a vital role in all sectors. Some of the issues such as finding the optimal path in routing, clustering, dynamic allocation of motes, energy and lifetime of the network pertaining to a wireless network can be solved using an NIC approach. Algorithms derived by the inspiration from nature are discussed briefly in this article.

KEYWORDS

Bio-Inspired, Evolutionary Chemistry, Evolutionary Physics, Swarm Intelligence

INTRODUCTION

Nature inspired computing (NIC) belongs to a class of meta-heuristic algorithms (Siddique & Adeli 2015). It is inspired by natural phenomenon and is comprises of various biological components such as humans and animals. NIC plays vital role in mapping the biological or nature cycle into machine intelligence. The process of designing intelligent systems has few stages, which comprises understanding natural process, designing the patterns of nature process, identification and technological modeling for the problem (Das & Barani, 2015). Nature or Biological

DOI: 10.4018/IJAEC.2019010101

cycle of animal has four powerful features such as self-healing, self-optimization, self-learning and self-processing. Nature behaves as self-optimizer and manages automatically its resources in an efficient manner for maintaining the equilibrium. This can be used for many technological aspects (Mukhopadhyay, 2014; Miettinen, 1999). Nature itself heals the problem and behaves normally; hence it acts as self-healer. The capability of learning is embedded in nature; hence it behaves as a self-learner. The processing ability of nature constitutes self-processor. The features of nature, inspired for developing various nature inspired algorithms (NIA). These algorithms are subject of computational intelligence and applied for optimizing engineering problems. As there is increase in dimensions, variables, time complexity, space complexity etc., to co-operate with such situation, NIA's evolved. It optimizes numerical benchmark functions, multi objective functions and solves NP-hard problems for large number of variables (Agarwal & Mehta, 2014). Living organisms exhibit sophisticated learning, decision making and processing abilities, which allow them to exist. NIC makes use of these characteristics in solving complex engineering problems.

Computer science engineering demands techniques of synchronization, parallelization, distributiveness, redundancy, scalability, robustness, cooperation, adaptability, manageability and coordination for solving large complex problems. Nature uses many techniques such as parallel processing, asynchronous, decentralized and collective behavior for solving the nature problems. These techniques from the nature can be imbibed for solving the complex engineering problems (Akl, 2007; Kotteeswaran & Rajesh, 2014). Recently NIC is being used as major tools in several areas of research such as MANET, VANET, AdHoc network, WSN, Congestion control in Internet, IoT, ubiquitous computing, image processing, semantic webs, big data analysis and cloud computing (Jamali, Valipoor & Analoui, 2009).

Objectives of this paper are as follows: (1) NIC algorithms developed by imitating the peculiar and attractive behavior of living beings such as human, animals, birds, insects, plants etc. can be used in various sectors in real time systems. (2) It helps the researcher to use NIC in wireless networks for finding optimal path in routing. (3) To show the capability of NIC in minimizing the complexity of problems. (4) NIC assures security and privacy in Wireless network due to the prominent features of nature. (5) It helps in increasing the network lifetime by detecting the fault nodes in wireless network. (6) To illustrate the role of NIC in achieving Quality of Service (QoS) in Wireless network. (7)To highlight the coordinated decentralized system in Wireless network.

The paper is organized as follows. Section 2 describes about classification of NIC and physics/chemistry-based algorithms are discussed. Section 3 presents algorithm inspired by Biological phenomena, its classification and applications. The paper is summarized in Section 4.