

Chapter 12

Bioinspired Algorithms in Solving Three- Dimensional Protein Structure Prediction Problems

Raghunath Satpathy
MITS Engineering College, India

ABSTRACT

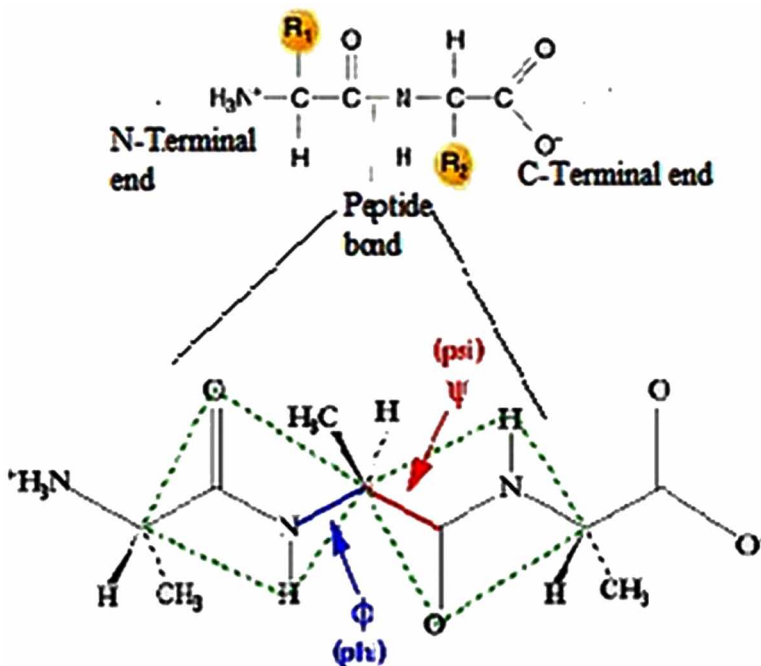
Proteins play a vital molecular role in all living organisms. Experimentally, it is difficult to predict the protein structure, however alternatively theoretical prediction method holds good for it. The 3D structure prediction of proteins is very much important in biology and this leads to the discovery of different useful drugs, enzymes, and currently this is considered as an important research domain. The prediction of proteins is related to identification of its tertiary structure. From the computational point of view, different models (protein representations) have been developed along with certain efficient optimization methods to predict the protein structure. The bio-inspired computation is used mostly for optimization process during solving protein structure. These algorithms now a days has received great interests and attention in the literature. This chapter aim basically for discussing the key features of recently developed five different types of bio-inspired computational algorithms, applied in protein structure prediction problems.

DOI: 10.4018/978-1-5225-2375-8.ch012

1. INTRODUCTION

Proteins belong to one of the major classes of macromolecules that are ubiquitously present in the living systems. These molecules are often envisaged as the molecular machines of life because they carry out many types of functions starting from catalysis, transport, regulation movement, transport, signaling, immunity and structure determination. Due to the versatility of the proteins, it is important to study their role area in molecular and cell biology. As the number of completely sequenced genomes grows, we are faced with the important but daunting task of assigning a function to proteins encoded by newly sequenced genomes (Habeck et al., 2005). A protein, is a polymer of amino acids can adopt different conformations and the most stable state is achieved by minimization of energy is known as native state (Lee et al., 2007; Whisstock et al., 2003). Amongst the 20 different naturally occurring amino acids, any two can join in a series by forming the peptide bond (C=O ---NH linkage), that remains in a plane. Figure 1 represents the peptic bond in between two amino acids, planar feature has been shown in dotted green lines, R1 and R2 corresponds to the functional group of two amino acids.

Figure 1. Peptide bond in between two amino acids



20 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: www.igi-global.com/chapter/bioinspired-algorithms-in-solving-three-dimensional-protein-structure-prediction-problems/177993

Related Content

Trans-Canada Slimeways: Slime Mould Imitates the Canadian Transport Network

Andrew Adamatzky and Selim G. Akl (2014). *Natural Computing for Simulation and Knowledge Discovery* (pp. 251-265).

www.irma-international.org/chapter/trans-canada-slimeways/80070

Fractal Top for Contractive and Non-Contractive Transformations

Sarika Jain, S. L. Singhand S. N. Mishra (2012). *International Journal of Artificial Life Research* (pp. 49-65).

www.irma-international.org/article/fractal-top-for-contractive-and-non-contractive-transformations/101294

Cellular Automata Communication Models: Comparative Analysis of Parallel, Sequential and Asynchronous CA with Simple Threshold Update Rules

Predrag T. Tošić (2012). *Nature-Inspired Computing Design, Development, and Applications* (pp. 271-290).

www.irma-international.org/chapter/cellular-automata-communication-models/66782

The Planning Net: A Structure to Improve Planning Solvers with Petri Nets

Marcos A. Schreiner, Marcos A. Castilho, Fabiano Silva, Luis A. Kunzle and Razer A. N. R. Montañó (2015). *International Journal of Natural Computing Research* (pp. 16-36).

www.irma-international.org/article/the-planning-net/126481

Explosion Operation of Fireworks Algorithm

Jun Yu and Hideyuki Takagi (2020). *Handbook of Research on Fireworks Algorithms and Swarm Intelligence* (pp. 56-70).

www.irma-international.org/chapter/explosion-operation-of-fireworks-algorithm/252902