

DNA COMPUTING TECHNIQUE TO SOLVE THE GRAPH COLORING PROBLEM AND AN APPROACH TO TACKLE THE EXPONENTIAL SOLUTION SPACE

Abstract

DNA computing is a branch of computing which uses DNA, biochemistry, and molecular biology hardware, instead of the traditional silicon-based computer technologies.

It is a computing technique which uses DNA molecules to store information and biochemistry operations as a computational tool to manipulate strings in DNA strands to produce the result. Here, we propose a DNA based computer to solve the graph coloring problem using a greedy approach to generate all possible solutions to coloring a graph.

Although it has been evidenced that DNA computing is able to solve the graph coloring problem in polynomial time, the exponential solution space is still a restrictive factor in applying this technique for solving really large problems. This paper also proposes a modified DNA computing approach based on Adleman-Lipton model which tackles the mentioned restriction by coloring the vertices one by one. In each step, it expands only those DNA strands encoding promising solutions and discards those which encode infeasible ones.