

## An Ant Colony System for Solving DNA Sequence Design Problem in DNA Computing

### Abstract

Deoxyribonucleic acid (DNA) is a nucleic acid that contains the genetic information used in the development and functioning of all known existing organisms. In DNA computing, a set of DNA sequences is involved in solving an optimisation problem. The design of those sequences is difficult because of the frequency of DNA sequence mis-match hybridisations. In this paper, an Ant Colony System approach for DNA sequence design is proposed to solve this DNA sequence design problem. A 4-node state transition machine was used in this study as the computation model. During the implementation, each ant was placed randomly at a start node and then moved according to the state transition rule. Once all of the ants completed the tour, the objective function was computed. This process was repeated until the maximum iteration was obtained. Seven ants were used to design seven sequences that were 20 nucleobases in length. The results showed that a set of usable DNA sequences can be produced using this method, which is better than previous approaches using the Genetic Algorithm and Multi-Objective Evolutionary Algorithm