Extraction of Complexes Using a DNA Computing Model

Anthony J. Macula*
Department of Mathematics
SUNY Geneseo
Geneseo, NY 14454
macula@geneseo.edu

October 4, 2002
3:45 - 4:30 pm
Newton 214

Abstract

The (relative) specificity of hybridization between a DNA strand and its Watson-Crick complement can be used to perform mathematical computation. In 1994, L. Adleman used DNA to solve a small Hamiltonian path problem. His experiment demonstrated that the existence and nature of a solution can be achieved by the formation and isolation of a certain DNA molecule. Adleman's "toy" demonstration was the first indication that the massive (i.e, exponential) parallelism of DNA reactions could be exploited to overcome the exponential time complexity (via a silicon computer or Turning machine) of NP complete problems so that they could possibly be solved in linear *real* time. To achieve the potential of DNA computing, many bio-engineering huddles need to be overcome.

In this general audience talk, we discuss an applied mathematical problem, a possible DNA approach to its solution and some of the bio-engineering problems that arise. Here is the abstract mathematical problem

Problem 1 *Let* $[n]$ *denote the set* $1, ..., n$. *Let* $[2^n]$ *denote the power set of* $[n]$. *Let* P_1, P_2, $...P_m$ *be fixed subsets of* $[n]$. *Find all subsets of* $[n]$ *not contained in any* P_i *with* $1 \leq i \leq m$.

*Supported by AFOSR