Lewis University
STEM Undergraduate Research Experience (S.U.R.E.) 2019
Faculty Mentor - Project Application

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Graph Theoretical Design Strategies for Modeling Self-Assembling DNA

Abstract

Motivated by the recent advancements in nanotechnology and the discovery of new laboratory techniques using the Watson-Crick complementary properties of DNA strands, formal graph theory has become useful in the study of self-assembling DNA complexes. Construction methods developed with concepts from undergraduate level graph theory have resulted in significantly increased efficiency. One recent focus in DNA nanotechnology is the formation of nanotubes which can be modeled using a lattice graph. These nanotubes are thought to have wide-ranging potential, such as containers for the transport and release of nano-cargos, templates for the controlled growth of nano-objects, and in drug-delivery methods. The rules governing the structure of these nanotubes are not yet well understood, and this naturally offers open problems in the realm of applied graph theory. In this research, we will focus on mathematical construction methods for self-assembling DNA structures which involve junction branched molecules whose flexible k-arms are double strands of DNA.