

THE BRAID INDEX OF DNA DOUBLE CROSSOVER
POLYHEDRAL LINKS

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Abstract

In this paper, the authors study the mathematical properties of a class of alternating links called polyhedral links which have been used to model DNA polyhedra. The motivation of such studies is to provide guidance and aid in the research of the properties of certain DNA molecules. For example, such studies can provide characterizations of the structural complexity of DNA molecules. In an earlier work, Cheng and Jin studied the mathematical properties of such polyhedral links and were able to determine the braid index of a double crossover polyhedral link with 4 turn. However, the braid index of a double crossover polyhedral link with 4.5 turn remained an unsolved problem to this date, even though the graphs that admit the double crossover polyhedral links with 4.5 turn have been synthesized. In this paper, we provide a complete formulation of the braid index of a double crossover polyhedral link with an arbitrary turn number. Our approach is more general and it allows us to completely determine the braid indices for a much larger class of links. In the case of the double crossover polyhedral links, our formulation of the braid index is a simple formula based on a simpler graph used as a template to build the double crossover polyhedral links.