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Polynomial Invariant of Graphs Modeling Nucleotide Rearrangements.

Spatial graphs with 4-valent rigid vertices, also called assembly graphs, describe homologous DNA rearrangements. The possible products of these rearrangements correspond to so called “polygonal paths” in these graphs (paths that take 90-degree “turns” at every vertex). The paths are extracted from the graph by smoothing the vertices, i.e. an operation of removing the vertices and reconnecting the resulting pairs of free neighboring edges. Through smoothings we have developed a polynomial invariant of the assembly graphs capable of distinguishing between different types of rearrangement. These polynomials are motivated by Tutte polynomials and have a number of interesting properties. We will discuss these properties and emphasize the connection between the polynomials and circle graphs. In addition, we will mention how these polynomials can be used to study rearrangements in other biological contexts. (Received January 17, 2012)