Minimal Tile and Bond-Edge Types for Self-Assembling DNA Graphs of Triangular Tiles

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We examine self-assembling DNA from a graph theory perspective based on the tile model. These tiles represent junction branched molecules whose arms are double strands of DNA. We consider a family of graphs obtained by a string of connected triangles. Given a target graph G, a pot of tiles is designed in order to achieve G in three different scenarios corresponding to distinct levels of laboratory constraints. In the first scenario, graphs of a smaller size than G are allowed. In the second scenario, nonisomorphic graphs of the same size as G are allowed, but not graphs of smaller size. In the third scenario, only graphs isomorphic or larger in size to the target graph are allowed. We find the minimum number of tile types and bond-edge types for each of the three scenarios.

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