

## Subgraph Removal of 4-Regular Graphs and Changes in Genus Ranges

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A rigid vertex is a vertex with a prescribed cyclic order of its incident edges. The genus range of a 4-regular rigid vertex graph  $G$  is the set of genera of closed surfaces that  $G$  can be cellularly embedded into. Consider the boundary components of the complement of  $G$  embedded into a closed surface  $F$ . The genus  $k$  of a cellular embedding is dependent on the number of boundary components, where the number of boundary components is dependent on how each vertex is structured in  $F$ . Each vertex can appear in two different ways within  $F$  so that, for a graph of  $n$  rigid vertices, there are up to  $2^n$  constructions of boundary components. Inspired by models of DNA rearrangements, we study the change in the genus range of a graph  $G$  after the removal of certain graph structures in  $G$ . We identify subgraphs where the removal of such subgraphs does not change the genus range.

Keywords: cellular embedding, rigid vertex, genus range