

# Spanning disks in toroidal embeddings

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## Abstract

Let  $\Phi$  be an embedding of a graph  $G$  in a surface  $S$ . If there exists a subset  $K$  of  $S$  bounded by a subgraph of  $G$  such that  $K$  contains all vertices of  $G$ , then  $K$  is called a spanning subset of  $\Phi$ .

Examples of spanning subsets include spanning disks and spanning annuli with some number of holes (the latter are called planarizing sets in some papers). A spanning subset may provide a simpler structure, yet still contain enough information to approach certain problems about graphs embedded on surfaces. In this talk, we prove that any embedding of a 4-connected graph in the torus with representativity at least three has a “spanning disk”—i.e., a contractible disk which contains all vertices of the graph and which is bounded by a cycle of the graph. Some potential applications will be discussed. This is joint work with Xiaoya Zha.