

Embeddings of Graphs and Hypergraphs in One-dimensional and Two-dimensional Grids

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A one dimensional embedding of an n node graph $G(V, E)$ is a one-to-one mapping $\pi : V \rightarrow \{1, \dots, n\}$. Three cost measures are usually associated with an embedding:

1. The bandwidth: $\max_{(u,v) \in E} |\pi(u) - \pi(v)|$.
2. The cutwidth: $\max_{i=1}^{n-1} |\text{cut}(\pi^{-1}\{1, \dots, i\}, \pi^{-1}\{i+1, \dots, n\})|$.
3. Sum of edge lengths: $\sum_{(u,v) \in E} |\pi(u) - \pi(v)|$.

The problems of finding embeddings that minimize these cost measures are NP-Complete problems, and approximation algorithms have been proposed for them.

An overview of these approximation algorithms will be given. Generalizations to hypergraphs and two-dimensional embeddings will be discussed as well as related open problems.