

Karger's Algorithm

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Algorithmic Paradigm

Karger's algorithm to solve the global minimum cut problem is a randomized algorithm.

Performance

Let $G(V, E)$ be an undirected graph, with possible parallel edges.

Time complexity:

- $\Omega(n^2m)$ in the best case.

Space complexity:

- $\mathcal{O}(1)$ (in fact $\theta(n \log n)$) on average;
- $\mathcal{O}(1)$ in the best case;
- $\mathcal{O}(\log n)$ in the worst case.

Algorithm

The random contraction algorithm for edges:

- While there are more than 2 edges ($|E| > 2$), choose a remaining edge $e = (u, v) \in E$ uniformly at random;
- Collapse vertices u and v into one single vertex (so that the edge is “contracted”). If $u = v$, remove the self-loop produced;
- Return the minimum cut (G represented by the final two vertices).

Remark. The probability of producing a global minimum cut through this randomized algorithm is not 100%.

Implementation