Min-Cuts Algorithms

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Motivation

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This here is the introduction of Cut Problems.

Definition

Karger's Algorithm

- Contraction method is used.
- Randomized selection of Edges.
- Running multiple times of the algorithm will provide more accurate result.

Karger's Algorithm

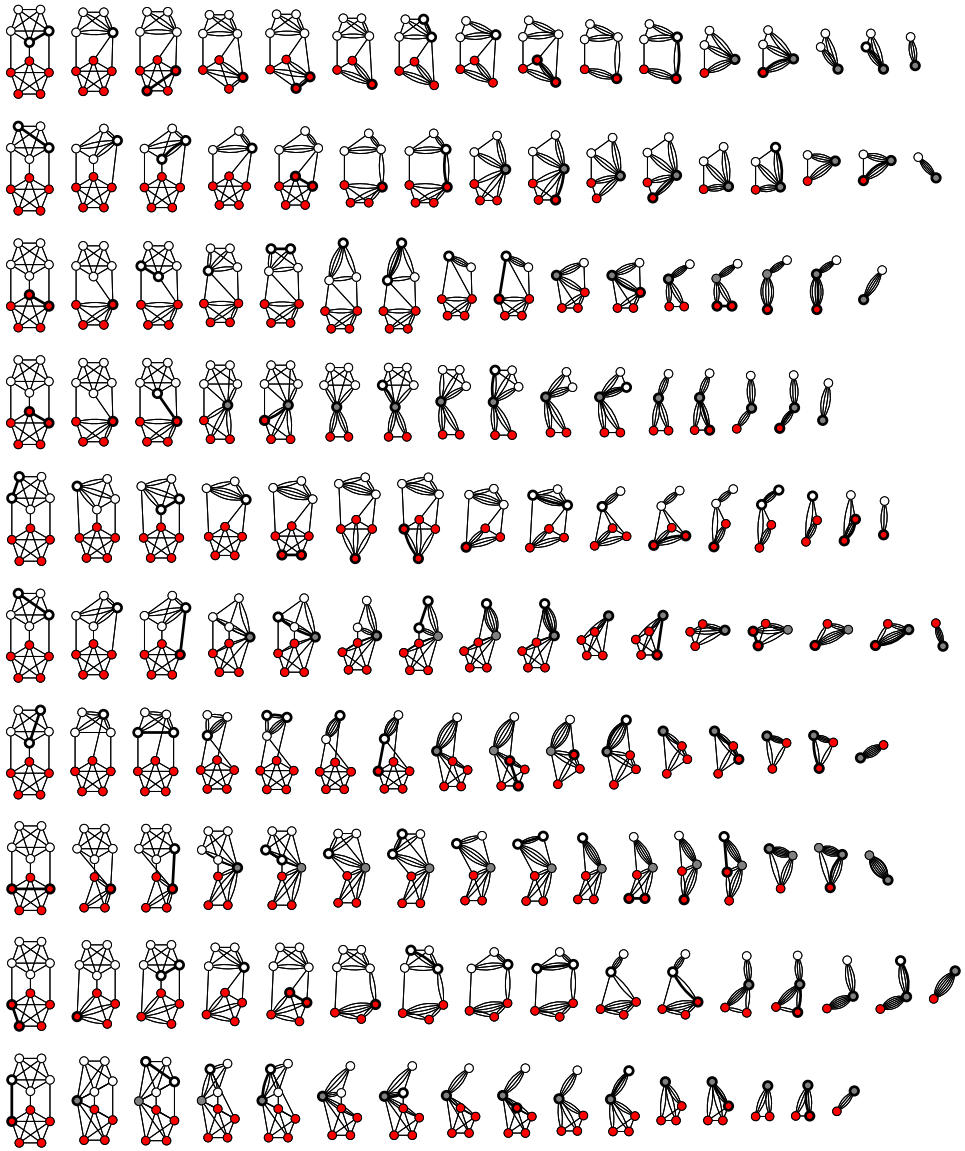
- Basically one run of Karger's Algo takes $O(n^2)$ time.
- It achieves error probability of $\frac{1}{poly(n)}$ with $O(n^4 \log n)$ time.

Derivation will be given in the later part.

Karger's Algorithm

Algorithm

Results



Sum of Degrees

Fact 1

$$\sum_{u \in V} \text{degree}(u) = 2|E|$$

Every edge contributes exactly once to the degree of exactly two nodes.

Average Degree

Fact 2

$$E(\text{degree}(X)) = \sum_{u \in V} Pr(X = u) \cdot \text{degree}(u) = \frac{1}{n} \sum_{u} \text{degree}(u) = \frac{2|E|}{n}$$

References