Randomized Minimum Cut

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The Randomized Minimum Cut algorithm (Karger's Algorithm) is a probabilistic graph algorithm used to find the minimum cut of an undirected graph. It works by repeatedly selecting a random edge and contracting its endpoints until only two supernodes remain, where the number of edges between them represents a cut. Due to randomness, multiple runs increase the chance of obtaining the true minimum cut. Here are the solution approaches:

1. Read the number of edges and store the graph as a vector of edge pairs ((u, v)).
2. Initialize a random number generator to support randomized edge selection.
3. Repeat the contraction process while the number of remaining edges corresponds to more than two supernodes.
4. Randomly select one edge from the edge list.
5. Take the two endpoints of the selected edge as vertices (a) and (b).
6. Remove the selected edge from the list to begin contraction.
7. Traverse all remaining edges and replace every occurrence of vertex (b) with vertex (a).
8. While redirecting edges, add the updated edges to the list and remove the old ones.
9. After merging, check the edge list for self-loops where both endpoints are the same.
10. Remove all self-loops since they do not affect the cut.
11. Continue randomly contracting edges until only two supernodes remain.
12. Count the remaining edges between the two supernodes.
13. Output the number of these edges as the cut size.
14. Print the remaining edges to show the final cut structure.