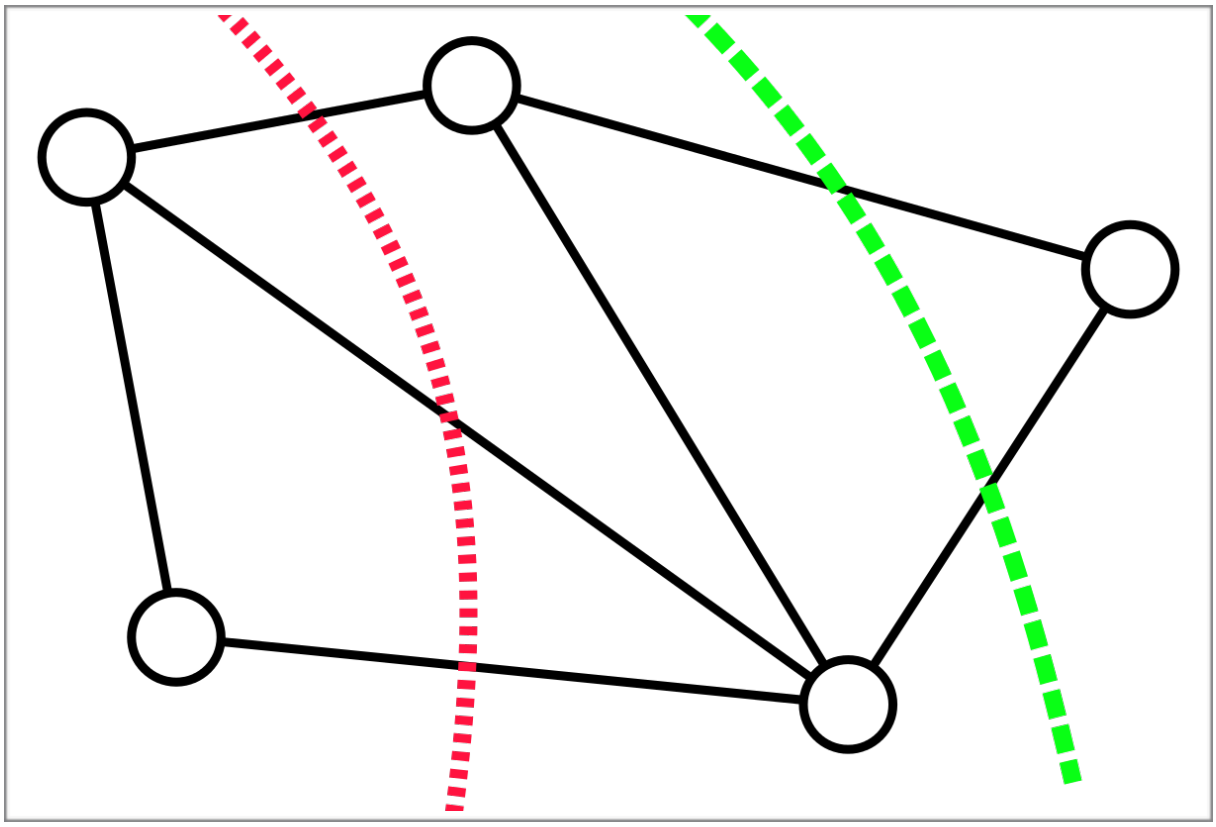
BLG 336E 3rd Project Report

Analysis of Algorithms II



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Thomas' Shops

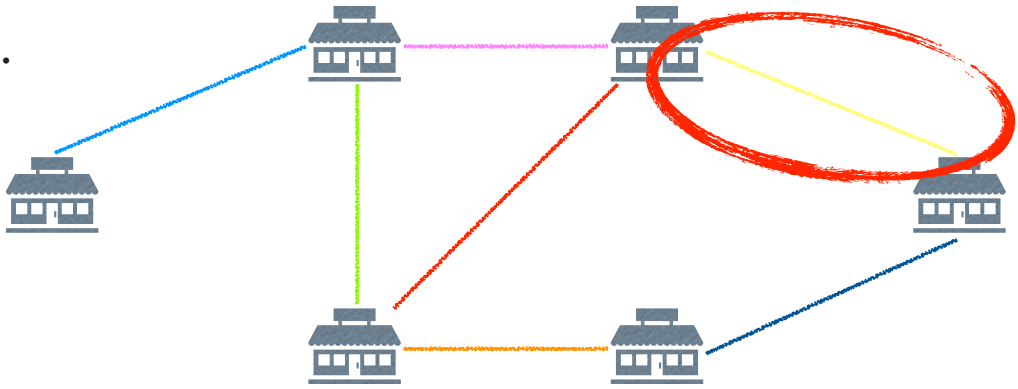
1. Why Karger's Algorithm? What is its subproblems?

I used Karger's Algorithm. Because, Karger's Algorithm is used to find **minimum cut** in an undirected, unweighted and connected graphs. Given graph to us is undirected, unweighted and connected.

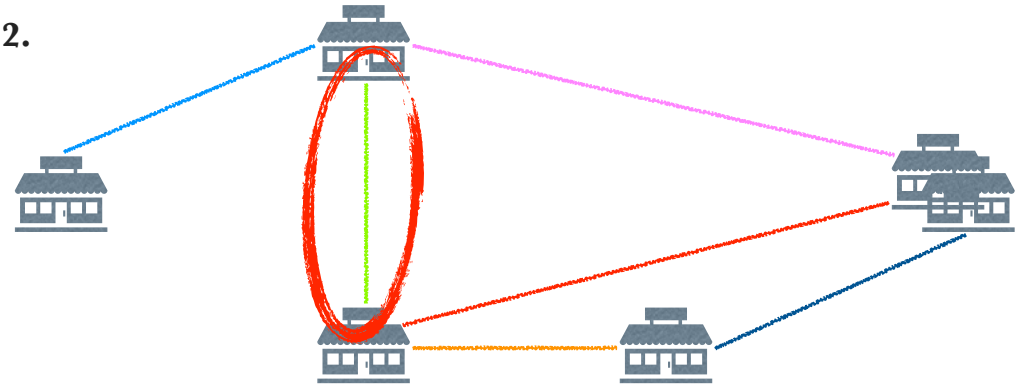
Karger's Algorithm is based on to select an edge randomly, so it does not always produce the minimum cut. Probability that the minimum cut produced by Karger's Algorithm is greater than or equal to $1/n^2$.

My implementation's workflow[1] is given below.

1.

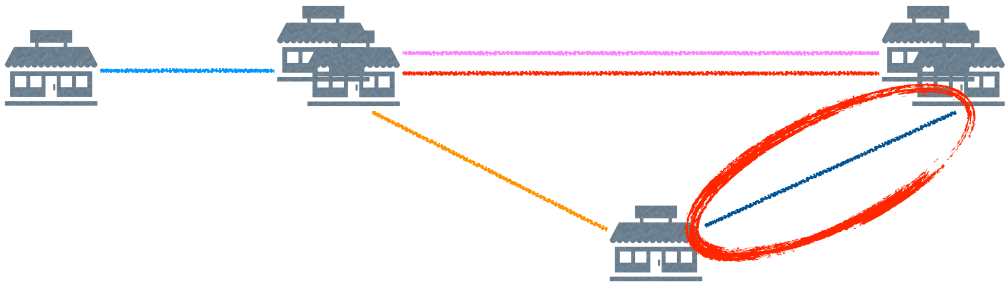


2.



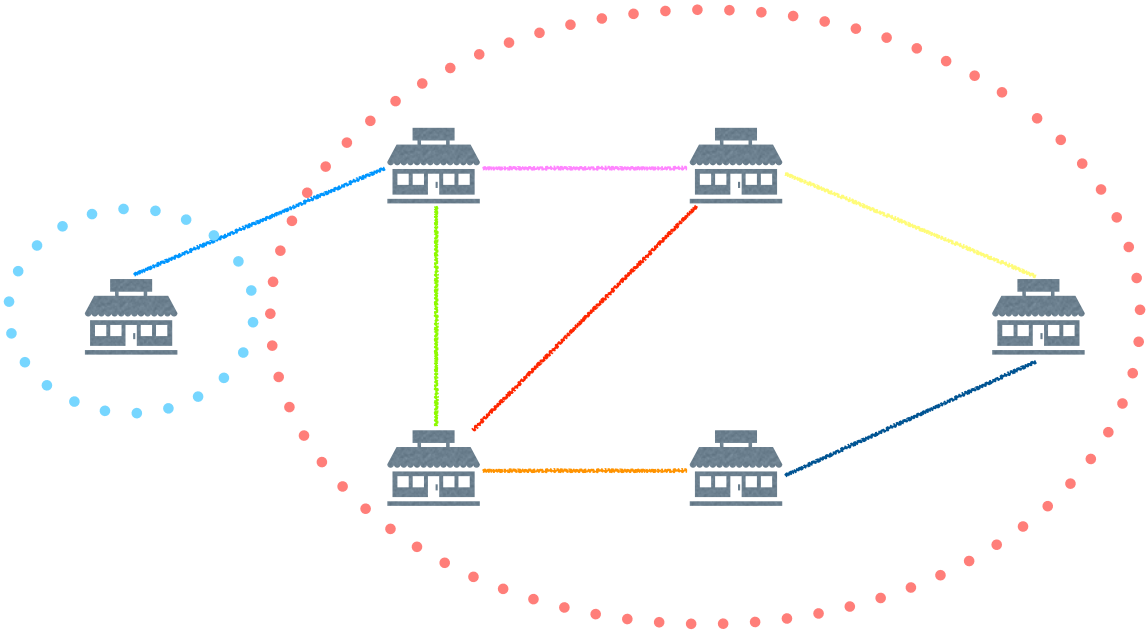
[1] Algorithm can produce many different solutions. Given workflow is just one of them.

3.



4.

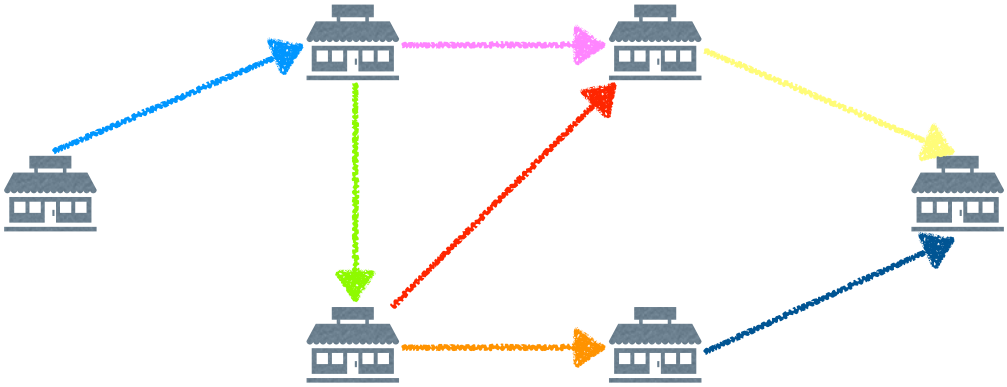
5.



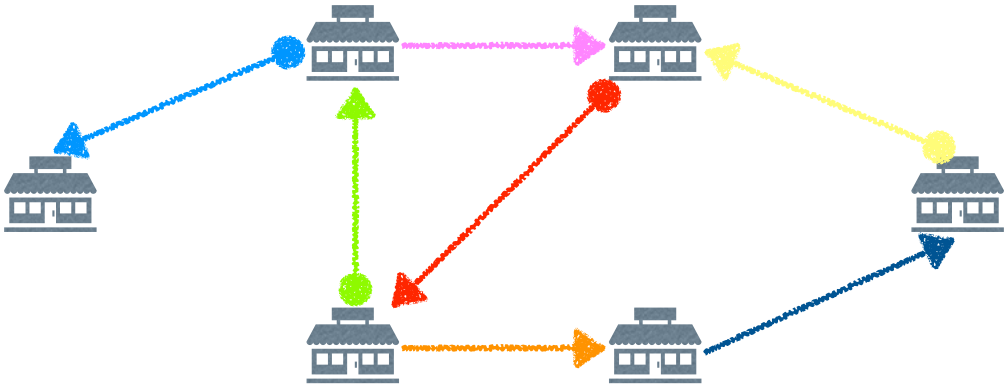
Roads are implemented by different colors. Red circles show contracting edges. Self-loops are removed if occurs. After 4th step, two self-loops are occurred and they are removed by passing to 5th step. At the end of all steps, only blue road is cutted. Minimum cut is 1 in this solution.

2. Ford-Fulkerson Algorithm

Graph G is given below. Maximum flow is found 1 by Ford-Fulkerson Algorithm. After algorithm running, directions of many edges[2] are changed.



Residual Graph of a flow network is a graph which indicates additional possible flow. If there is a path from source to sink in residual graph, then it is possible to add flow. Every edge of a residual graph has a value called residual capacity which is equal to original capacity of the edge minus current flow. Residual capacity is basically the current capacity of the edge. Here, our roads are equal and their capacities are 1.



[2] light blue, green, red and yellow edges

Start point has no outgoing edge. It means there is no way to go end point from the start point. So max-flow of residual graph is 0.