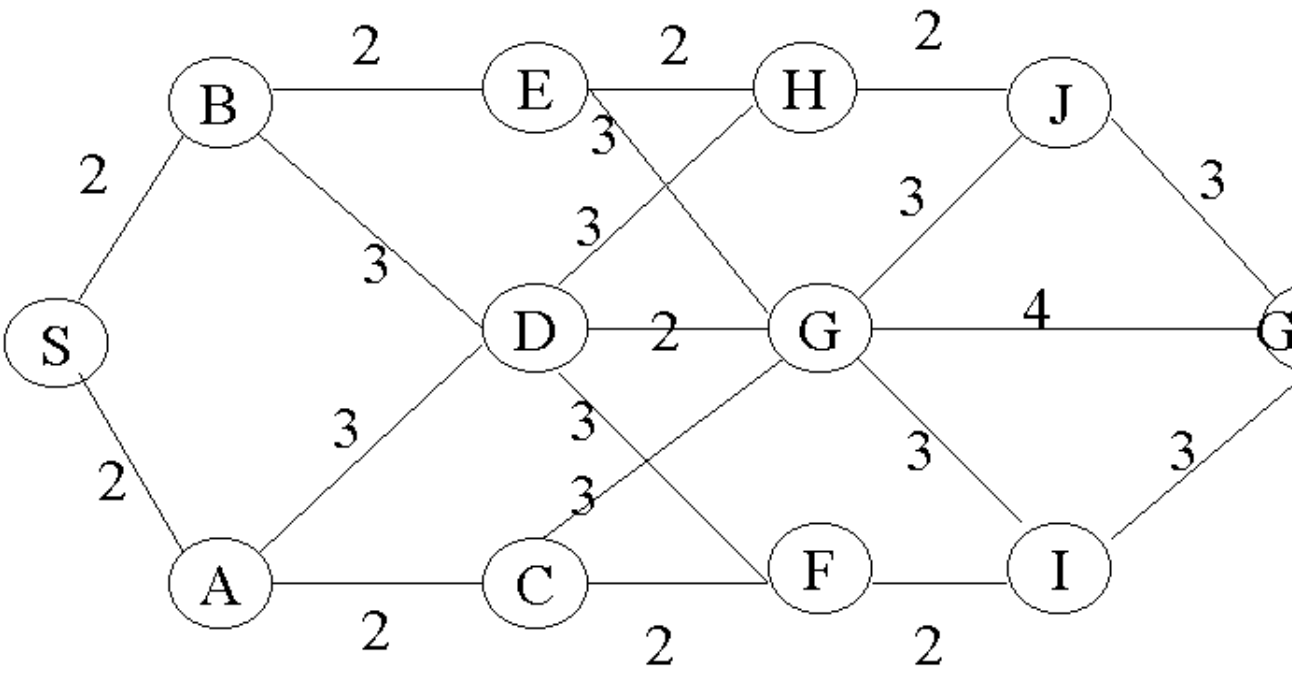

4 Traveling Salesman

4.1 Basic Search

Given the graph above, determine the number of distinct partial paths explored starting at S to reach the goal node. Assume that you examine children in alphabetical order when given no other information.

1) Depth-first Search
2) Breadth-first Search

4.2 Optimal Search

Using straight line as-the-crow-flies as an estimate of distance, find the shortest path with

1) Branch-and-bound
2) A*

Giving the shortest path and number of distinct partial paths explored

Node	Distance to Goal
S	10
B	8
A	8
D	6
C	6.5
E	6.5
G	4
F	4.5
H	4.5
I	3
J	3

Table 1: As-the-crow-flies distances to goal

starting at S to reach the Goal.

4.3 Genetic Algorithms

Formulate traveling salesman as a genetic algorithm.

4.3.1 Part A

Define the genes, chromosomes, and measure of quality.

4.3.2 Part B

Define a basic mutation operator and a crossover operator.

4.3.3 Part C

What would constitute a good initial population of one individual?

4.3.4 Part D

The constraints on TSP cause some problems for the classic mutation and crossover operators. Give one problem for each operator.

4.3.5 Part E

Because the problems with the usual implementations of mutation and crossover, most people who try to solve TSP with GA's implement a new "permutation" operator. Explain why a permutation operator might be good choice for evolving a solution to TSP. Describe your own permutation operator and demonstrate two applications to your initial individual population.