CS F422 - Assignment 2 : Problem 2

Problem Statement

Branch and Bound Algorithms: A skeleton using MPI and OpenMP.

1. Read and understand: Isabel Dorta, Coromoto Leon and Casiano Rodrıguez. *A comparison between MPI and OpenMP Branch-and-Bound Skeletons*. Proceedings of the Eighth International Workshop on High-Level Parallel Programming Models and Supportive Environments (HIPS'03) (available via BITS Library - IEEE subscription)
2. Design a hybrid Branch-and-Bound Skeleton scheme for a target platform that is a cluster of workstations.
3. Choose two hard / pseduo-hard problems (e.g. 0/1 KnapSack, TSP, Graph Coloring, Factorization) and encode each of them using the Branch and Bound skeleton .
4. Implement your solution using MPI for message passing programming on the cluster and OpenMP for shared memory programming within a single node. Implement your solution in three steps:
    1. MPI version where each process is single-threaded
    2. OpenMP version to run in a multicore node
    3. A hybrid version combining both of these.

5. Performance Measurement:
    1. Run the encoded solution on various inputs of varying sizes and measure the time taken.
    2. Demonstrate scalability of your solution by plotting a performance curve with varying number of nodes in the cluster (M = 1, 2, 4, 8) and varying number of threads in a multi-core node (N = 1, 2, 4, 8).