Efficiency of Linear Programming, Integer Programming and Minimal Spanning Tree for Network Model

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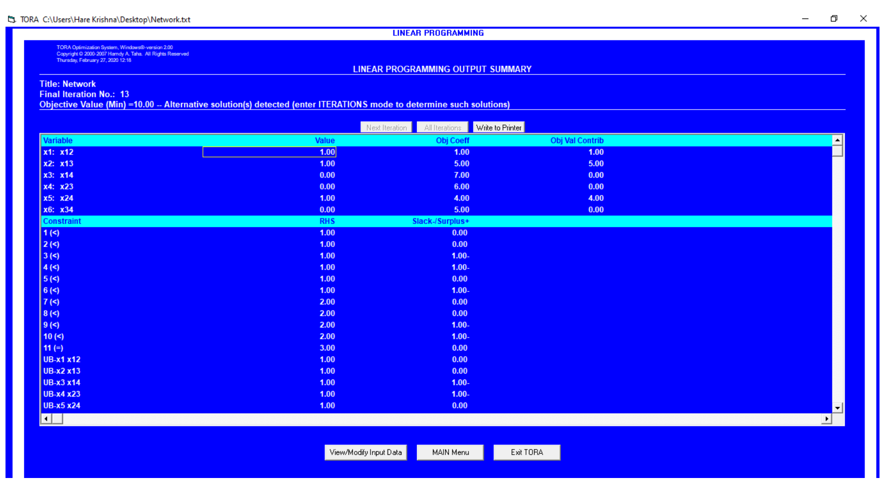
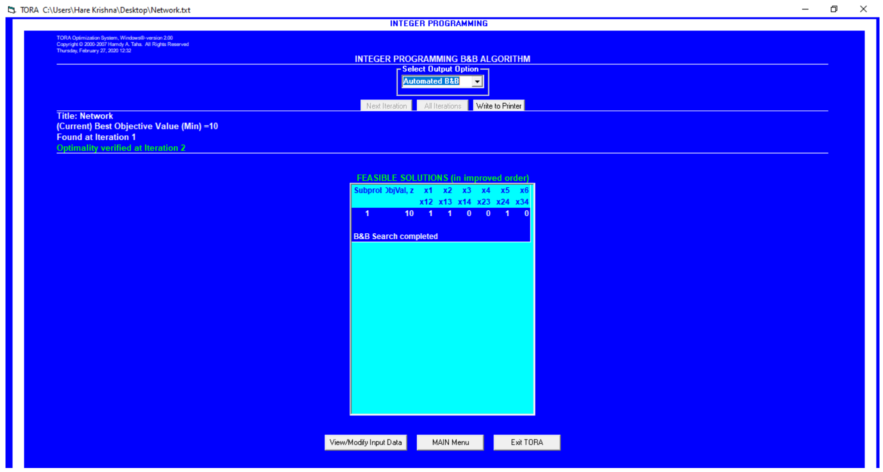
Abstract

The problem of finding minimal spanning tree is a famous combinatorial optimization problem for which polynomial time algorithms exits. The problem of finding minimal spanning tree appears in different engineering and service applications, particularly in designing computers, telecommunication, transportation and water supply network. In addition it has a number of computational applications such as clustering a data point in a plane, handwriting recognition and providing approximate solution for the travelling salesman problem. Some recent applications include cell nuclei segmentation, Alzheimer's classification, water looped network equilibrium and characterizing local urban patterns. In this article we are finding minimal path of a network problem by converting that problem in linear programming and integer programming using TORA and MATLAB. We also find the minimal spanning tree using these computer software and check that which one is more efficient and less time consuming.

Hosted file

`Network Problem.pdf` available at https://authorea.com/users/319696/articles/449411-efficiency-of-linear-programming-integer-programming-and-minimal-spanning-tree-for-network-model




TORA C:\Users\Hare Krishna\Desktop\Network.txt
INTEGER PROGRAMMING
TORA Optimization System, Windows®-version 2.00
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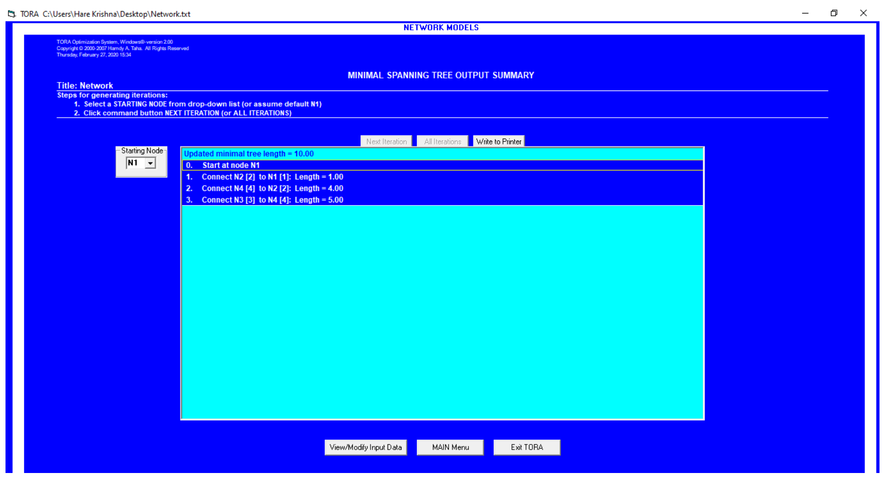
Thursday, February 27, 2020 12:32
INTEGER PROGRAMMING B&B ALGORITHM
Select Output Option
Automated B&B
Next Iteration
All Iterations
Write to Printer
Title: Network
(Current) Best Objective Value (Min) =10
Found at Iteration 1
Optimality verified at Iteration 2
FEASIBLE SOLUTIONS (in improved order)
Subprol ObjVal, z x1 x2 x3 x4 x5 x6
x12 x13 x14 x23 x24 x34
1 10 1 1 0 0 1 0
B&B Search completed
View/Modify Input Data
MAIN Menu
Exit TORA


TORA C:\Users\Hare Krishna\Desktop\Network.txt
NETWORK MODELS
TORA Optimization System, Windows®-version 2.00
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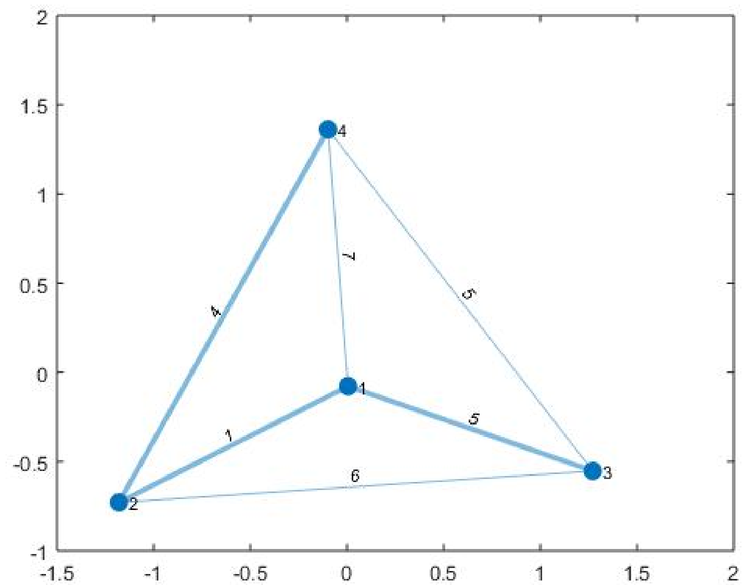
Thursday, February 27, 2020 15:34
MINIMAL SPANNING TREE OUTPUT SUMMARY
Title: Network
Steps for generating iterations:
1. Select a STARTING NODE from drop-down list (or assume default N1)
2. Click command button NEXT ITERATION (or ALL ITERATIONS)
Next Iteration
All Iterations
Write to Printer
Starting Node
N1
Updated minimal tree length = 10.00
0. Start at node N1
1. Connect N2 [2] to N1 [1]: Length = 1.00
2. Connect N4 [4] to N2 [2]: Length = 4.00
3. Connect N3 [3] to N4 [4]: Length = 5.00
View/Modify Input Data
MAIN Menu
Exit TORA


2
1.5
1
0.5
0
-0.5
-1
-1.5
-1
-0.5
0
0.5
1
1.5
2
4
1
2
3
4
7
5
1
5
6