MAE 552 – Heuristic Optimization

Lecture 25

March 22, 2002

Topic: Tabu Search

A Simple Illustration of Tabu Search

. Simple Version of the short term memory component of the
abu Search is illustrated in this example.

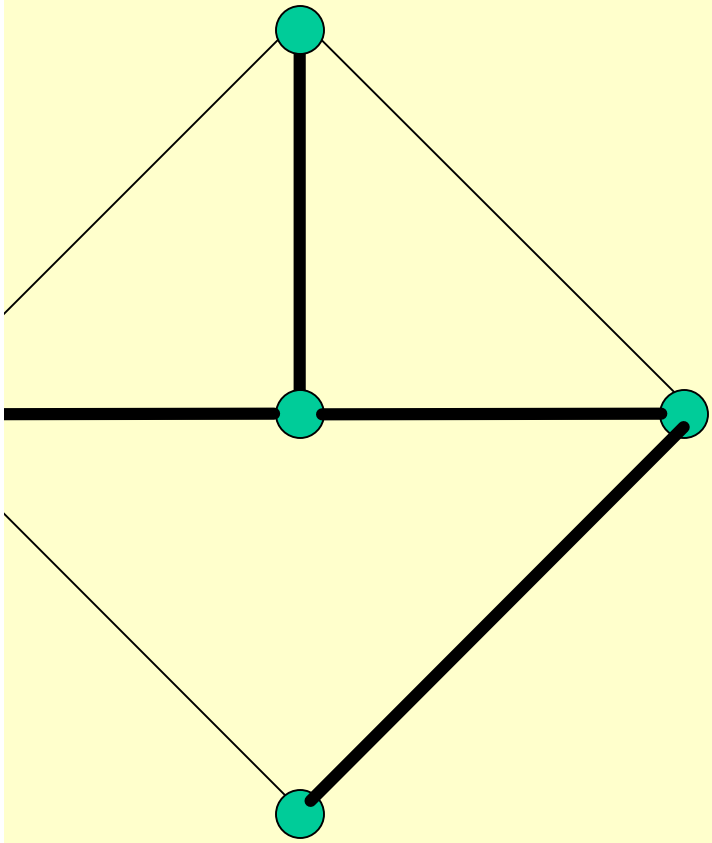
he problem is known as a minimum spanning tree problem

he minimum spanning tree (MST) of a graph defines the
eapest subset of edges that keeps the graph in one connected
mponent.

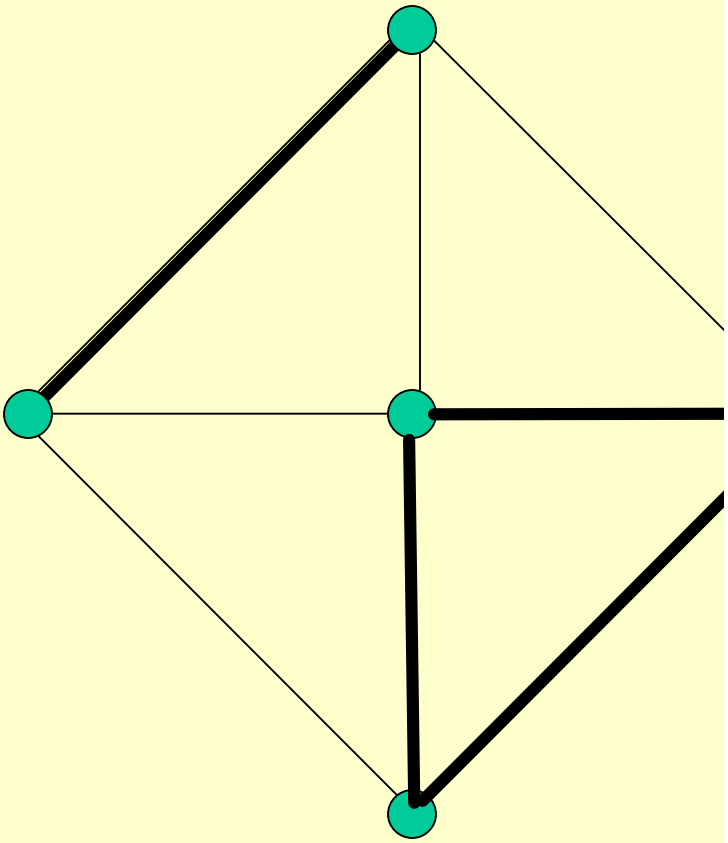
elephone companies are particularly interested in minimum
anning trees, because the minimum spanning tree of a set of
es defines the wiring scheme that connects the sites using as
tle wire as possible.

A Simple Illustration of Tabu Search

gal Spanning Tree



Illegal Spanning Tree



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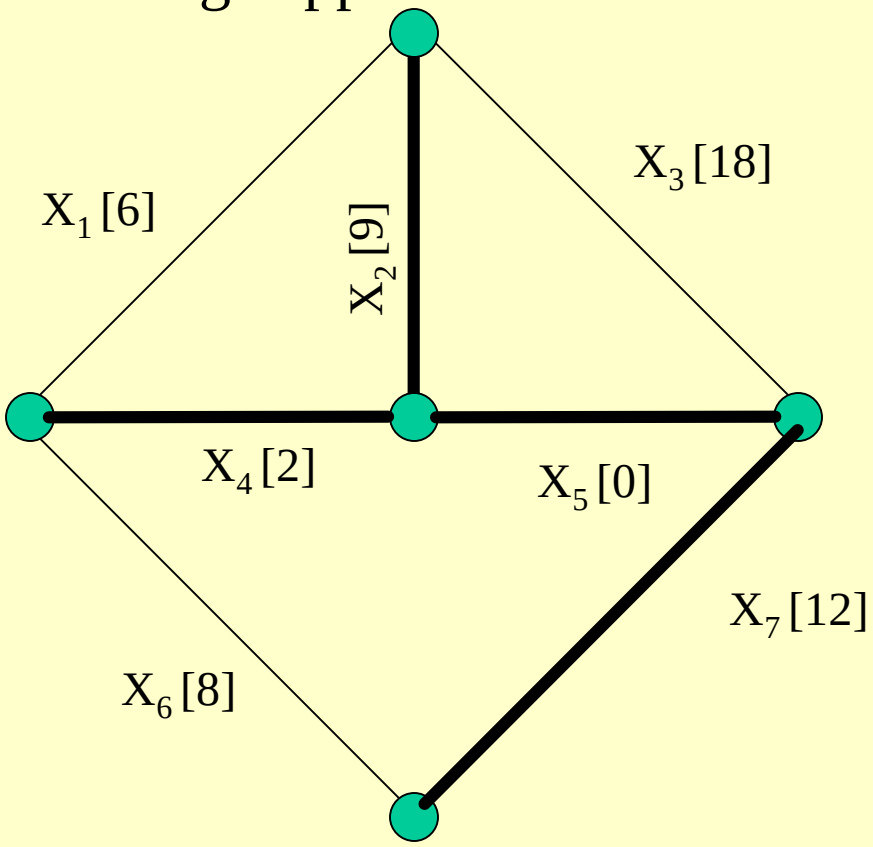
solution can be represented in terms of a vector indicating ether or not an edge appears in the solution.



This solution is (0,1,0,1,1,0,1) and F=23

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dditionally there are constraints imposed on this problem.

onstraint 1: At most only one of edges 1, 2, or 6 can be used
me time.

$$x_1+x_2+x_6\leq 1$$

onstraint 2: Edge 1 can be in the tree only if edge 3 is also i
ee

$$x_1\leq x_3$$

o permit the evaluation of the infeasible trees a penalty of 50
lded for each unit violation of a constraint. The a unit violat
hen the left side of the constraint exceeds the right side by 1

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define a Tabu restriction, we have decided to use the *added*
ge to be the move attribute assigned Tabu status.

is forbids a future move from dropping the edge as long as i
nains Tabu.

e length of the tabu list for this example is 2.

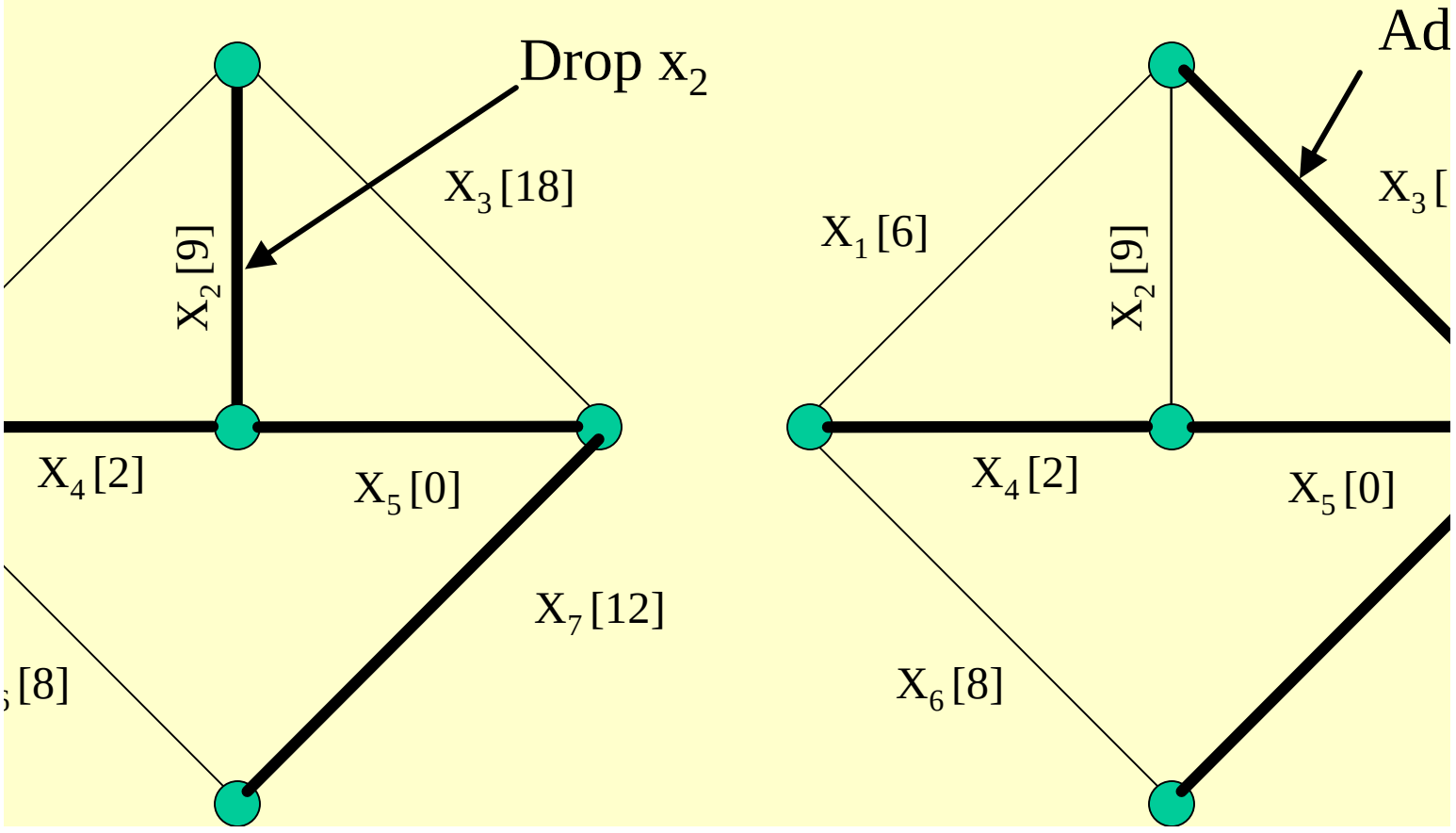
move remains Tabu for two iterations and then is dropped fr
list

e aspiration criteria that we have selected is that a tabu
triction can be overridden if the resulting tree is better that a
t produced so far.

A Simple Illustration of Tabu Search

r this example a move will be a standard edge swap that con
emoving an edge and adding an edge to make a new legal tr

e solution selected will be the admissible move with the low
t including penalty costs.



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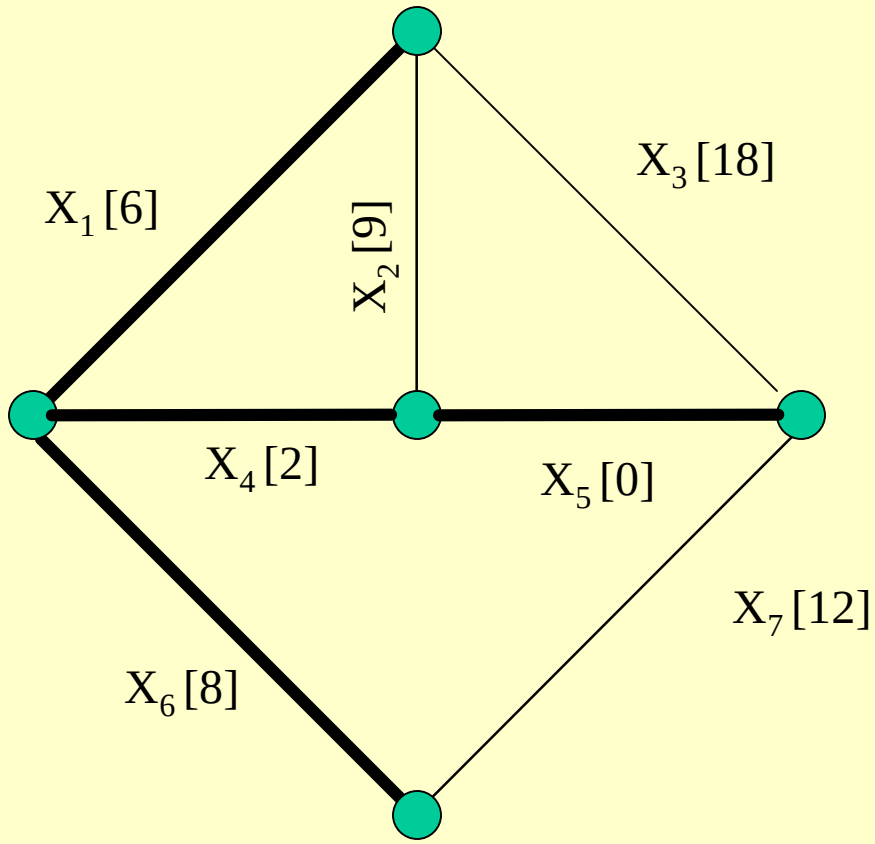
tial Solution Cost = 16 + 100 = 116



Current Best Poin
Infeasible

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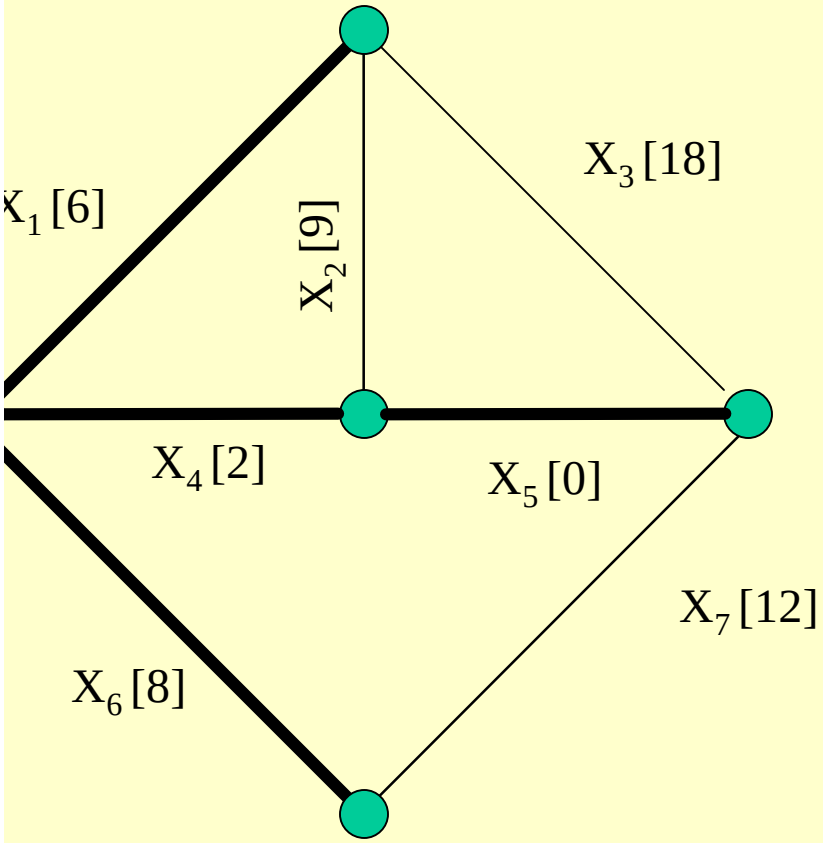

Search neighborhood

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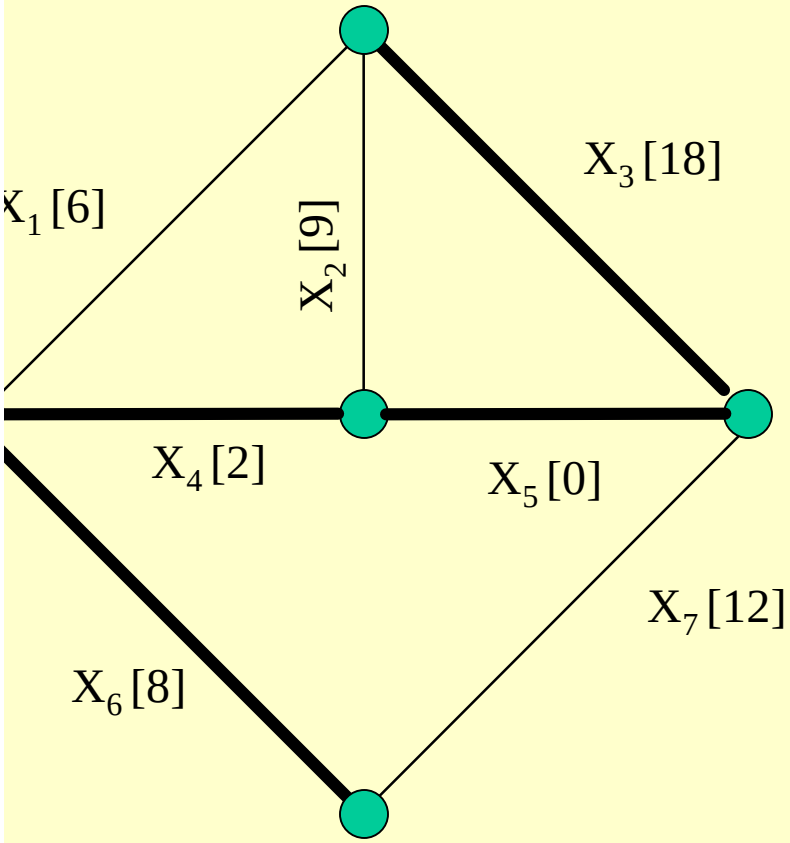
ration 2: Current Cost 28 Tabu List: x_3 M=[0 0 2 0 0 0 0]



Search neighborhood

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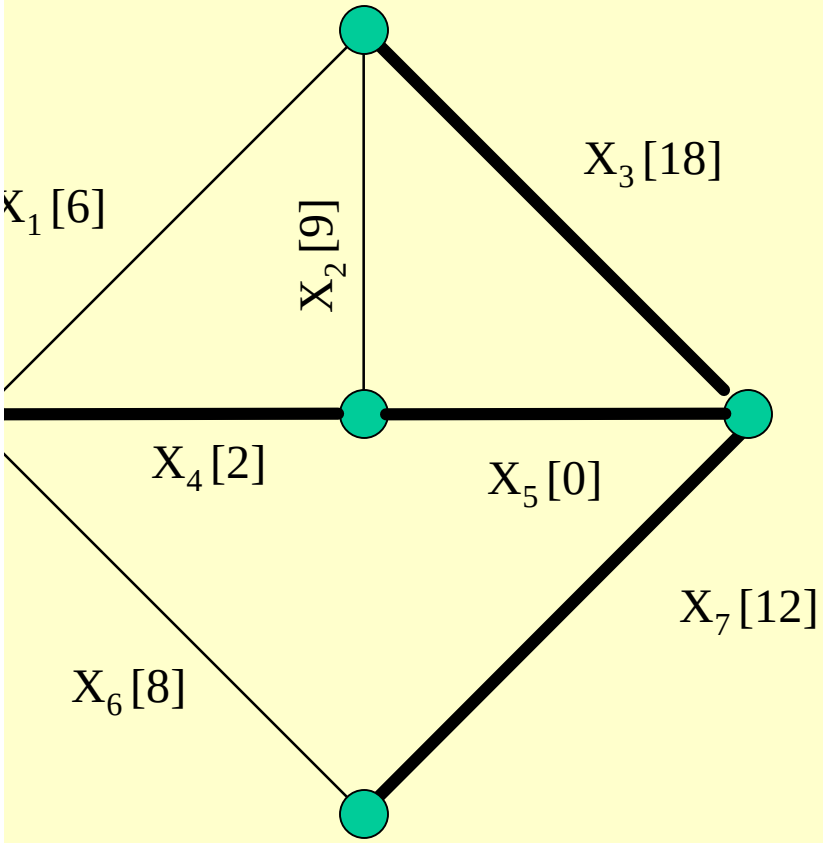
ration 3 Current Cost 32 Tabu List: x_3 M=[0 0 1 0 0 0 2]



Search neighborhood

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nal Cost 23 Tabu List: x_3 M=[0 2 0 0 0 0 0]