

Friday, April 28, 2023

Lecture #40

MSSC 6000

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Announcements

* Homework 6 due the last day of class

11:59pm

* Final Exam (take-home) assigned last day of class, due Friday, May 13, 11:59pm

* Course Evaluations are open

Topic 14 - Tabu Search (continued)



Pseudocode:

(2)

generation = 0

taboo = dict() # track when a move is allowed again

taboo_time = 20

x = random element of search space

while True:

generation = generation + 1

neighbors = nbhd(x) # each neighbor is a pair (s, m) where s is the solution, and m is the move that turned x into s

(new_x, move) = the pair (s, m) in the set of neighbors such that either m is not a key in "taboo" or $\text{taboo}[m] \leq \text{generation}$ with the highest score

taboo[move] = generation + taboo_time

Advanced Topics

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- * Sometimes using just the "move" as the taboo is too restrictive. In this case, you can a taboo list of (move, score) pairs — this only prevents a move if it would lead to the score you got last time you did that move.
- * **Aspiration Criteria:** Decide to ignore the taboo list in some cases, for example if you find a taboo solution that's better than anything you've ever seen.
- * If neighborhoods are large (like TSP) this makes things slow. Two options:
 - (i) change the tweak function to allowEx: knapsack. One possible tweak function is: } constraint violation

Pick 0 or 1 items to remove.
Then Pick 0 or 1 items to add.

(4)

With n items, the size of the neighborhood is $O(n^2)$.

New tweak:

add 1 item OR remove 1 item
 $O(n)$

might exceed capacity — allow this
but with a score penalty

(2) another way to deal with large neighborhoods is: instead of steepest ascent (check the entire neighborhood) just check some fraction of the neighborhood (1%, 10%)

* extra intensification (exploitation) or diversification (exploration)

Sometimes people set up T.S. to pause and go into a different mode to focus on more exploitation or exploration. (5)

- Keep track of how often certain components of solutions are used in best/worst/any candidate.

Ex. How often a particular item is used among the 100 best or 100 worst solutions you've ever seen.

If more intensification is needed:
restart the search with the best solution so far and require some of the items to be in the knapsack.

If more diversification \Rightarrow forbid those items