

Review added by Hossein Khodadadi (313884) and Abolfazl Javidian (314441).

The writer has introduced quite innovative heuristics that satisfy the condition of admissibility, except for the h4 and h5 functions, as mentioned by the writer. For instance, the size of an untaken set is determined solely by the number of elements within the set that have not yet been covered, or the sizes of untaken sets are determined by excluding the covered elements. These untaken sets are then sorted by size. The optimistic estimate is the minimum number of the first N untaken sets, the sum of whose sizes is greater than or equal to the number of uncovered elements.

First, we have added seed = 41 for reproducibility purposes. Second, for h1 and h2, the writer has divided the number of missing elements by the size of the largest set (considering only the uncovered elements), so that the heuristic becomes optimistic. At first glance, it is workable, but in many cases, neither works nor is optimal. For instance, consider a subset containing only one True value related to one position, while other subsets are False for that specific element. Based on this approach, the algorithm will assign the lowest priority to this subset, which increases the number of iterations to reach the optimal solution since the algorithm has no other way except exploring all nodes to reach the goal. Considering this fact and by removing the divisions for h1, h2, h4, and h5, the number of iterations will be reduced to 7.

Third, an interesting idea for finding the proper heuristic is as follows: when we have multiple h functions, while each h is working partially better than others, it would be better to consider their maximum, i.e., $\text{Max } \{h_1, h_2, h_3, \dots, h_n\}$. This idea has been tested for the problem, but it does not improve the result, as each h is constantly above or below the other h.

You can access the modified code through the following link:

https://github.com/HOSSEKhodadadi/Computational_Intelligence/tree/main/Lab_01_review

