

CMPUT 657 Heuristic Search
Assignment 1 Report
Part 2

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Enhancements

The search mode 2 utilizes the reduction of memory consumption due to use of bit-wise operations and optimized representation of states in Transposition Table. The given memory limit is 200 MB, which allows the use of larger Transposition Tables, which takes up the largest amount of memory of the entire program.

Considering that the states can be represented using unsigned long long integers (8 bytes), the total required memory for storing the board states in an increased transposition table of size 6000119 can be approximated as follows:

$$\begin{aligned} \text{memory} &= 6000119 \times 8 = 48000952 \text{ bytes} \\ &= 46876 \text{ kilobytes} = 45.77 \text{ megabytes} \end{aligned}$$

Here, the size 6000119 is selected as it is the highest possible prime number that can be selected without crossing the 200 MB memory limit. A prime number works better when performing a modulus and storing in the attained index value. Including other variables of the program and the transposition table of the mentioned size, the memory taken by the program while running is 190 MB (approx.). The remaining 10 MB is kept as a safeguard so that the memory limit is not exceeded. Besides change in memory, the comparison and storing of states is also faster.

Although, the bit-wise operation enhancement is part of Deliverables 2, it is difficult to include it in search mode 2 as the memory limit is exceeded when the entire transposition table is represented using character array states of same size. Therefore, the search mode 1 is only implemented using the same transposition table size but only the smaller sized indexes are accessed.

Furthermore, the initial search window of $-\infty$ and ∞ , which is represented by -70 and 70 in my program is changed in search mode 2. Initially I used the limits $(-70, 70)$ as the maximum achievable score in an 8×8 board is 64 (without any obstacles). However, if there are obstacles, the maximum and minimum achievable score changes, furthermore, if any opposite piece count is somehow decreased to zero, the search window changes even more. I have decreased the window size accordingly when searching for the best possible move in search mode 2.