Artificial Intelligence: Assignment 1

Part B: Report

Bin Packing Problem

To tackle the bin packing problem using a genetic algorithm, you have to take a grouping approach. This means that the usual approach to using genetic algorithms such as ordering, are not as useful when tackling this problem. The operations used widely in genetic algorithms such as crossover and mutation are not aware of bins and their processes.[1]

After some research it has shown that the best approach is to apply a hybrid genetic algorithm.[2]

The approach I attempted was more along the lines of continuing the code from Part A, which proved to cause some problems. However, I'll attempt to explain the function of the main methods within the code, i.e., fitness function and the total genetic algorithm method.

Fitness Function: My approach to this was to calculate the total weight of the individual items to be packed in bins. The code iterates over each item in the 'individual' type and checks if it's packed in a bin. If it is packed, the weight is added to total weight. To use this in calculation of the fitness function, the method returns 1 if the weight is less than or equal to the capacity of the bins, otherwise it produces a fitness of 0.

The genetic algorithm method has been kept the same as Part A.

Overall, this approach to the problem was unsuccessful, and in the future I understand that a more hybrid approach or grouping approach is more beneficial when dealing with the bin packing problem.

References

1**.** Janković, M. (2013) *Genetic Algorithm for Bin Packing Problem*, *CodeProject*. CodeProject. Available at: https://www.codeproject.com/Articles/633133/ga-bin-packing (Accessed: 8 February 2024).

2. Mohamed Amine Kaaouache, Sadok Bouamama, Solving bin Packing Problem with a Hybrid Genetic Algorithm for VM Placement in Cloud, Procedia Computer Science, Volume 60, 2015, Pages 1061-1069, ISSN 1877-0509,

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