COMP304

ASSIGNMENT II

REPORT/WRITE UP

a) Chromosome in the initial population and initial size used

*A chromosome in the initial population is represented by a bit string whose length is the number of genes. Where a '1' at a specific index in the bit string shows that the gene at that corresponding index, in the list of genes, is contained (in the case of this problem, a chromosome would represent a combination of boxes (genes)).

*An initial population size of 200 was used.

b) The fitness function used

* The fitness function was used as a measure of the 'offness' of a chromosome(combination) from the acceptable value. It was defined as follows:

```
if value < Quota:
        valueOffness = Quota – value
otherwise:
        valueOffness = 0


if weight > Capacity:
        weightOffness = weight - Capacity
otherwise:
        weightOffness = 0
```

the fitness of a chromosome is just the sum of then valueOffness and the weightOffness(ie fitness = valueOffness + weightOffness).

c) The Selection Method Used

* The tournament selection mode was used with a tournament size of 20.

d) The mutation operator and the mutation rate used

THE MUTATION RATE

A mutation rate of 0.1(10% was used). Although changeable in the constructor of the Genetic Algorithm.

THE MUTATION OPERATOR

For each bit in the string of the chromosome, a randomly generated float (between 0 and 1) was checked against the mutation rate, if the random number is below the mutation rate that bit is flipped.

e) The crossover operator and the crossover rate used

THE CROSOVER RATE

A crossover rate of 0.85(85%) was used. Although changeable in the constructor of the Genetic Algorithm.

THE CROSSOVER OPERATOR

For any two selected chromosomes, a randomly generated float (between 0 and 1) was checked against the crossover rate. If the number was above the crossover rate, the two chromosomes would not 'mate' and would go on unchanged onto the next generation; if, however, the random number is below the crossover rate the two chromosomes would, from a random point, exchange/swap part of themselves with their counterpart.

f)Termination Criterion

*The genetic algorithm terminates in one of two cases:

1) The number of generations evaluated has exceeded the magnitude of the power set of the set of genes of a problem (ie. 2^(|set of genes|)). For, if a single subset of the problem is evaluated at each generation, a solution (if any) is guaranteed in [2^(|set of genes|))-1](excluding the empty set) searches.
2) An individual/Subset/Combination/Chromosome with a fitness of zero (that isn't the empty set) is found.