CSC 4504 : Langages formels et applications

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/~gibson/Teaching/CSC4504/Assessment.pdf

Assessment

Assessment

- *NOTE: The deadline for submission is 5th January 2018, before noon*

- You will be evaluated on the work that you submit for each of the following problems:
  - Using a genetic algorithm to solve a complex problem
  - Implementing alpha-beta for intelligent play
  - Program in Prolog to check paths in graphs
  - Odds and Evens in Event-B - proving a non trivial property
  - NLP - Text predictor system
  - Neural network - perceptrons for lines and triangles
  - Swarm intelligence - research report/article on the state-of-the-art
  - Collective intelligence - distributed donations (sum) problem

- You mark is calculated as the average of your 3 best solutions.

Assessment

You should submit the following:

1) GA Solution to the TSP problem seen in the lectures

2) GA Solution to the following problem -

We have a set of integer weights (minimum size 10, maximum size 30). The set is to be partitioned into 2 subsets in such a way that the absolute difference between the sum of the weights in each set is minimised. In the best case, the 2 subsets should have the same total weight.

This **solution** should include **tests** to help in analysing the **performance** of the GA. It should also **comment** on the **design** of the fitness function, and the mutation and crossover function/rates.

Your submission will be evaluated based on the quality of your code, tests, analysis and documentation

Assessment

Implementing alpha-beta for intelligent play

You should submit the following:

1) Min-max alpha-beta algorithm for playing XO (as in the lectures)

2) Alpha-beta algorithm for playing any other 2 player game (of your choice), where a simple deterministic algorithm does not exist for playing 'perfectly'.

Your submission will be evaluated based on the quality of your code, tests and documentation

Assessment

Program in Prolog to check paths in graphs

You should submit the following:

1) Prolog Solution to the path in graph problem (as seen in the lectures)

2) A prolog solution to the problem of deciding if an arbitrary graph (of directed links/arcs) is connected

Your submission will be evaluated based on the quality of your code, tests and documentation

Assessment

Odds and Evens in Event-B - proving a non trivial property

Express as theorems and use RODIN to prove:

thm1. The addition of two even numbers is even

thm2. The difference between two odd numbers is even

thm3. The multiplication of an even number with an odd number is even

thm4. The multiplication of two odd numbers is odd

Your submission will be evaluated based on the correctness of your specification of the properties to be proved, the proofs, and documentation of both.

Assessment

NLP - Text predictor system

You should submit the following:

1) Implementation of a dictionary as a prefix tree (as seen in the lectures)

2) Improvement to the dictionary using a frequency count

3) Tests that demonstrate the gain in performance due to adding a frequency count

Your submission will be evaluated based on the quality of your code, tests and documentation

Assessment

Neural network - perceptrons for lines and triangles

You should submit the following:

1) Implementation of a NN (using perceptrons) for detecting the position of a point with respect to a line (in 2 dimensional space)

2) Implementation of a NN (using perceptrons) for detecting the position of a point with respect to a triangle (in 2 dimensional space)

3) Analysis of the training and performance of your NN implementations

Your submission will be evaluated based on the quality of your code, analysis and documentation

Assessment

Swarm intelligence - research report/article on the state-of-the-art

You should submit 1 of the following:

1) A presentation of the history of swarm intelligence (max 10 slides, with notes)

2) A presentation of the state-of-the-art in swarm intelligence (max 10 slides, with notes)

3) A summary of one publication in the area that you recommend as essential reading, with justification for your choice. (1-2 pages)

Assessment

Collective intelligence - distributed donations (sum) problem

As explained at the lecture, there is a party of donors who wish to give their donation (an integer sum) to a treasurer.

At the beginning of the party we wish the money to be randomly distributed amongst all the donors.At the end of the party we wish all the money to be with the treasurer.

Implement a distributed collectively intelligent algorithm to solve this problem. The algorithm should be based on donors having money interacting in a pair-wise fashion. So that after a donor-donor interaction there is only 1 donor with the sum of their money and the other donor with 0 money.

Your submission will be evaluated based on the quality of the code, tests and complexity analysis.