

MOMENTO DE AVALIAÇÃO

Curso(s): Informática

Unidade Curricular: Inteligência Artificial

Avaliação -

Docente: Ricardo Malheiro

Duração: -

Data: -

SUDOKU Solver

Sudoku is a puzzle based on the logical choice of numbers. The name of this game is due to the fact that in Japanese, "su" means "number" and "doku" means "unique". This name is directly related to the purpose of the puzzle: placing numbers 1 through 9 in each of the empty cells on the board so that there are no repeated numbers per row, per column, or sub-matrix. The game board consists of a 9×9 cell grid or matrix, and is also composed of 3×3 sub-matrices, each having 3×3 cells, as shown in Figure 1.

5	3			7				
6			1	9	5			
	9	8					6	
8				6				3
4			8		3			1
7				2				6
	6					2	8	
			4	1	9			5
				8			7	9

Figure 1 – Example of a Sudoku's puzzle

Usually each sudoku has only one solution. The solution for the puzzle of figure 1 is represented in figure 2 with the solution marked in red.

5	3	4	6	7	8	9	1	2
6	7	2	1	9	5	3	4	8
1	9	8	3	4	2	5	6	7
8	5	9	7	6	1	4	2	3
4	2	6	8	5	3	7	9	1
7	1	3	9	2	4	8	5	6
9	6	1	5	3	7	2	8	4
2	8	7	4	1	9	6	3	5
3	4	5	2	8	6	1	7	9

Figure 2 - Solution of the puzzle

The java code infrastructure that students will use in the project is provided. This infrastructure to be fully functional is missing the code of the execute () method of the AlgoritmoGenetico class. In this code, none of the 81 positions is fixed, i.e. the algorithm initially generates numbers from 1 to 9 for all 81 positions.

Tasks to implement in the project:

- a) Implement the execute () method of the AlgoritmoGenetico class.
- b) Implement the Roulette selection method.
- c) Implement the 2-point crossover method.
- d) Implement the uniform crossover method.
- e) Adapt the code to solve any puzzle (with solution) provided. In this case the algorithm must be tested for the following input puzzle:

5	3			7		
6			1	9	5	
	9	8				6
-----+-----+-----						
8				6		3
4			8		3	1
7				2		6
-----+-----+-----						
	6				2	8
			4	1	9	5
				8		7
						9

The program should generate the following file with the solution found for the problem:

5	3	4	6	7	8	9	1	2
6	7	2	1	9	5	3	4	8
1	9	8	3	4	2	5	6	7
-----+-----+-----								
8	5	9	7	6	1	4	2	3
4	2	6	8	5	3	7	9	1
7	1	3	9	2	4	8	5	6
-----+-----+-----								
9	6	1	5	3	7	2	8	4
2	8	7	4	1	9	6	3	5
3	4	5	2	8	6	1	7	9

f) The system should read the puzzle (s) from .txt file (s). These files should be named puzzle # .txt and puzzle # _solved.txt. Solutions will be valued where the manipulation of files is done by the graphical interface already provided.

Material to deliver:

Report, which should describe in detail:

- Coding of Individuals
- Operators Used:
 - the selection operators
 - Recombination Operators
 - the mutation operators
- The Fitness Function

Evaluation

The evaluation parameters are as follows:

Method executor()	8%
Method of selection (Roulette)	15%
Method of crossover (2-point)	15%
Method of crossover (uniform)	15%
Solve any type of puzzle	20%
Reading and writing console files (to 50%), graphical environment (to 100%)	10%
Defense	12%
Report (remaining)	5%
Total	100%

Final Notes

1. The work can be done individually or in groups of up to 2 students.
2. In the delivered elements (code and report), the number and full name of the students must be mentioned.
3. Any sign of copy / plagiarism will result in the cancellation of the work.