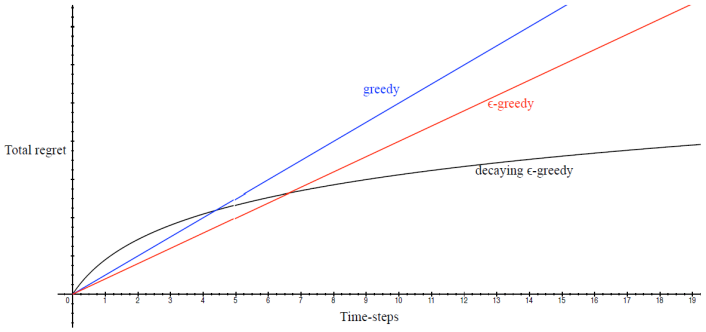
Computational Intelligence in Games Summer 2017

Prof. Dr. Sanaz Mostaghim, Alexander Dockhorn

4. Exercise Sheet

Assignment 17 Regret and Bounds

What is the meaning of the gradient of the regret function if we always use a greedy policy?



Assignment 18 Regret and Bounds

Imagine that you have to develop an agent for a game that lasts for at most T (e.g. T =1000) time steps. You have a model of this game and you are using Flat Monte Carlo.

a) When is exploration/exploitation more important and why?

b) How can you vary the agent's behavior towards exploration / exploitation depending on the time, when one of these is more important?

Assignment 19 Monte Carlo Tree Search

Describe and sketch the basic structure of a MCTS tree and the process of building such a tree.

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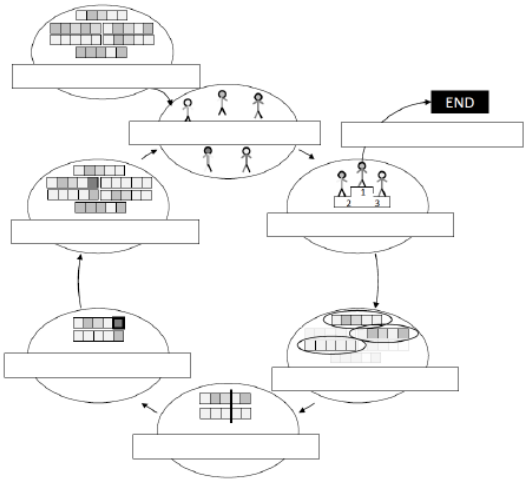
Assignment 20 Evolutionary algorithms

Describe and sketch the basic structure of an evolutionary algorithm.

Assignment 21 Evolutionary algorithms

Evolutionary Algorithms consist of several steps some of which are iteratively repeated. In the figure below, find the right place for the following step descriptions:

- Mutation
- Terminate
- Fitness Evaluation
- Create initial population
- Crossover
- Decoding
- Population Replacement
- Selection



Assignment 22 Genetic representation

Name two examples for genetic representations of solutions other than binary representations.

Assignment 23 Selection mechanisms

Given the following population in an Evolutionary Algorithm with the goal to maximize fitness. For each agent, compute the probability that it will be selected using fitness proportional selection mechanism. Complete the table one the right.

Index	Fitness	Probability
0	100	
1	100	
2	100	
3	2	
4	1	

Assignment 24 Selection mechanisms

Given the following population in an Evolutionary Algorithm with the goal to maximize fitness. Assume that individuals: (0 and 5), (0 and 5), (0 and 1), (0 and 3), (2 and 4), and (2 and 5) are selected for tournaments. Write down the winner for each tournament such that there are as many as possible different individuals from the current population amongst the winners.

Index	Fitness
0	1
1	4
2	4
3	10
4	4
5	1

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Assignment 25 Representation and recombination

Given the following two parents: 01101 — 11000.

a) Which of the solutions could be the result of a 1-point cross-over between these parents?

b) Which of the solutions could be the result of a 2-point cross-over between these parents?

c) Which of the solutions could be the result of a uniform cross-over between these parents?

Children	01100	00101	00101	01011	01001	01000	11001
1-point							
2-point							
uniform							

Assignment 26 Reproduction schemes

a) Which solutions would be in the next generation, if a $(\mu + \lambda)$-reproduction is used?

b) Which solutions would be in the next generation, if a (μ, λ)-reproduction is used?

Parents	Fitness	Children	Fitness	$(\mu + \lambda)$-reproduction	(μ, λ)-reproduction
101111	100	100000	60		
010000	20	011111	60		
101111	100	101100	70		
000100	40	000111	70		