Rheinische Friedrich-Wilhelms-Universität Bonn
Institut für Informatik
Abteilung VI
Autonome Intelligente Systeme

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Robot Learning

Assignment 2

Due Tuesday, May 9th, before class.

2.1) Consider a student taking an exam, which consists of *k* tasks.
For simplicity, we assume that the tasks *i=1,...,k* can either be solved, which results in the full number r_i of points, or not be solved, resulting in zero points (r_i=0).
After working on a task, the student knows whether the task has been solved or not. The student may attempt to solve each task a second time, but only when it has not been solved before.
For each attempt, the probability p_i of solving the task shall be independent. It depends only on the difficulty of the task and is as follows:

Task i	Points r_i	Solution probability p_i
1	8	0.35
2	6	0.4
3	10	0.15
4	2	0.9
5	7	0.4

Formulate this problem as a Markov Decision Process! 4 points

2.2) Assume that the student can attempt only N=6 tasks in the exam.
For passing the exam, the student needs to get at least 50% of the available points.
Model the probability of passing the exam. 4 points

2.3) The student considers two policies for choosing the tasks:
π_A: work on the tasks in sequential order, according to index i.
π_B: work on the tasks in the order of increasing difficulty (decreasing solution probability)
In both cases, the first non-solved task will be attempted again.
Compare the expected return of both policies! 4 points

2.4) Suggest an improved policy π_C that has a higher expected return than both of the above policies.
4 points

2.5) Give an example for a process model where the Markov assumption is not justified.
How can the state be augmented to make the assumption valid again?
4 points