

GWV – Grundlagen der Wissensverarbeitung

Tutorial 11 : Decision Networks

Exercise 1.1 : (Decision Newtorks 1:)

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You are familiar with the following scenario: The probability that a person controlled by the police is a smuggler is 0.01. The probability that a trained drug dog will bark at a smuggler is 0.8 – unfortunately these dogs also have false positive alarms. 1 out of every 20 persons sniffed by a drug dog will get the dog to bark even though that person is not a smuggler. (But maybe that person is a cat owner). Police not only rely on their dogs to identify smugglers. A smuggler will usually be nervous during a control and sweat a lot. Unfortunately there are also other reasons to sweat like having a fever. Police research showed the following results. If someone is not a smuggler nor has a fever then the likelihood that that person is sweating is zero. If its a smuggler without fever then the likelihood of sweating is 0.4, it increases to 0.8 if that person also suffers from a fever. Unfortunately the probability for a person that is not a smuggler and heaving fever is also quite high with 0.6. * Doctors claim that about 13 persons in 1000 is having a fever. Turn this into a decision network. Find the optimal decision policy for a security officer in the following scenarios and compute the utility. (Assume that searching a smuggler equals catching the smuggler.)

Scenario 1:

- If an officer catches a smuggler he gain a little reputation towards his next promotion. This is worth 5 Points.
- If an officer searches an innocent person, this equally decreases his reputation by 5 points.
- If on the other hand a security offices misses to search a smuggler this is a bad thing a worth -10 points.
- Not searching an innocent person is neither good nor bad.

Scenatio 2: Imagine that it does not matter if an innocent person is searched, what would be the optimal policy in this case?

Exercise 1.2 : (Decision Newtorks 2)

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Figure 1. shows a situation from a „Mensch ärgere dich nicht“ board. It’s blue’s turn and the player just rolled a 5. Which figure should be moved? Calculate the following 3

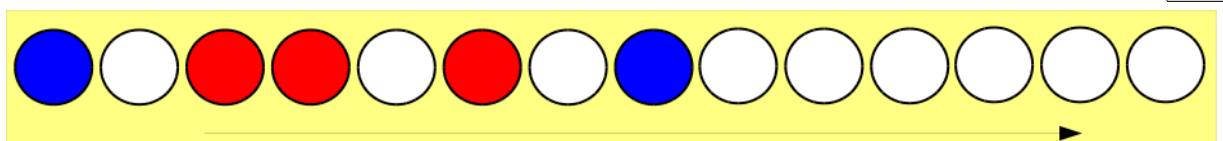


Figure 1: Blue’s turn

expected utilities: Utility after blues move, utility after the resulting counter move from red and utility after blue's second move. To do so look at two different scenarios:

- 1: This is a one person game, and the loss of a figure (roughly) equals beating a figure of the other player.
- 2: This is a multi player game with 4 players. So losing a figure is worse than beating a figure. Assume that losing a figure is at least twice as bad as the gain from beating an enemy figure.

Version: January 3, 2014
Achievable score on this sheet: 0