



FAKULTÄT FÜR
INFORMATIK

Lehrstuhl für Simulation

Applied Discrete Modelling

Assignment 5 “Diagnosis”: HMMs

System Specification

A specific disease can progress in up to three stages towards healing. We assume for this model, that one step is equivalent to one day. The probability of healing after one day is 0.1, independent of the current disease state. The one step probability of progressing from stage 1 to stage 2 is 0.3. The probability to progress from stage 2 to stage 3 is 0.15. At the beginning of the simulation the patient has the disease in stage 1.

The temperature is measured daily and the following probabilities for fever apply to this disease: in stage 1 $P(\text{fever}) = 0.1$, in stage 2 $P(\text{fever}) = 0.5$, in stage 3 $P(\text{fever}) = 0.8$.

Implementation

Obtain or build a tool that is able to solve the Evaluation and Decoding problem for HMM. (e.g. MatLab, C, Excel...)

Tasks and Questions

Specify and draw the HMM representing the system.

Use your program to answer the following questions:

- What is the most likely sequence of test results in the first three days in the hospital?
- What is the probability of three days with fever in a row (trace: *fever, fever, fever*) in the first three days in the hospital?
- What is the probability of that trace (*fever, fever, fever*) after 5 days in the hospital?
- What is the most likely path that led to observing three days without fever in a row (trace: *OK, OK, OK*) in the first three days in the hospital?
- What is the most likely path of that trace (*OK, OK, OK*) after 5 days in the hospital?