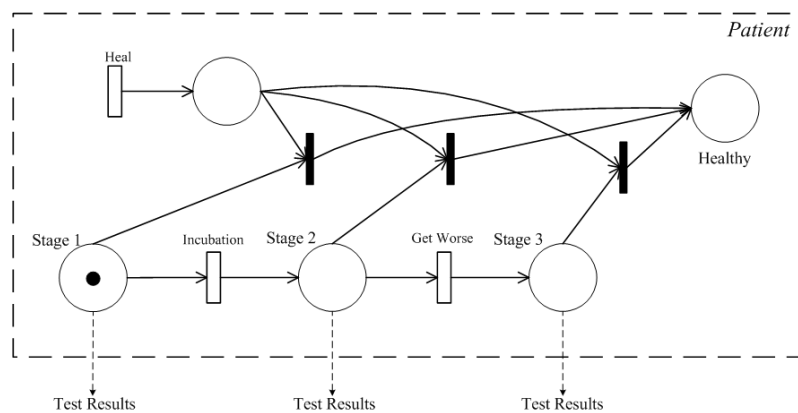


## Lehrstuhl für Simulation

### Applied Discrete Modelling

#### Semester Assignment “Diagnosis”

The object of the semester assignment “Diagnosis” is a patient who is hospitalized and needs to be treated, but his disease is not yet known. It will be used to apply the knowledge and implement the algorithms taught throughout the semester. Students will see the different levels of applicability of the methods and understand their features and shortcomings. The improvements and new developments in current research will be motivated and demonstrated.



The system is specified as follows:

The course of a non-terminal disease can be described by three stages. The first stage represents the incubation period, where the patient has hardly any detectable symptoms. The second and third stage represent the actual period of sickness, where stage three is worse than stage two. The healing of the patient can happen in each of the states, and results in the patient returning to state healthy, which is absorbing. The transitions between the disease stages happen after random amounts of time.

During the surveillance of the patient, tests are conducted at regular intervals: taking temperature every day, urine test ever second day, blood test every third day. The results of the tests are affected by the stage of the disease and by individual susceptibility, reflected by randomness. The taking of the temperature results in *fever* or *none*, where the probability of fever in stage one is 0.1, in stage two 0.5 and in stage three 0.8. The blood test can have one of three results (*a*, *b* and *c*), each with different probability in each of the stages: stage one (0.7, 0.2, 0.1), stage two (0.5, 0.3, 0.2) and stage three (0.2, 0.3, 0.5). The urine test can have one of three results (*a*, *b* and *c*), each with different probability in each of the stages: stage one (0.8, 0.1, 0.1), stage two (0.6, 0.3, 0.1) and stage three (0.5, 0.3, 0.2).

The test results are recorded in the patients file. Your task is to determine in which stage of disease the patient is currently in, if he ever reached stages 2 or three. Given three possible diseases with their specific model, your second task is to determine which disease the patient was most likely suffering from.