An Introduction to Specification and Verification

Exercise 2, Jan. 25th 2008

1. Specify labelled transition system, which models a variable. The variable can have values 0, 1, or 2. The labelled transition system has following features:

    - The variables intial value is **0**
    - event *to0* assigns **0** to the value of the variable
    - event *to1* assigns **1** to the value of the variable
    - event *to2* assigns **2** to the value of the variable
    - event *is0* is available, if the value of the variable is **0**
    - event *is1* is available, if the value of the variable is **1**
    - event *is2* is available, if the value of the variable is **2**

2. Specify a labelled transition system, which models a vending machine. The labelled transition system has following features:

    - event *1p* gives money 1p to the machine
    - event *2p* gives money 2p to the machine
    - event *choc* chooces a little chocolate
    - event *bigchoc* chooses a big chocolate
    - event *toffee* chooses toffee
    - event *gum* chooses chewing gum
    - event *collect* collects the selected item.

    Events occur in order money, choice and collect. If the user wants to buy a big chocolate or toffee, she have to give 2p and choose either a big chocolate or toffee. Little chocolate and chewing gum costs 1p each.

3. Modify the labelled transition system of the exercise 2, so that it is possible after giving *1p* either to buy a little chocolate or chewing gum, or give more money and buy a big chocolate or toffee.

1

Modify further the labelled transition system so that after the total amout of the given money is 2p, it is possible to buy which ever of the alternatives the user likes. If it was given too much money the automata gives back money.

4. Specify a labelled transition system, which models a bag and has the following features:

   - The bag can contain numbers 0 and 1
   - The bag can hold not more than 3 numbers at a time
   - *out0* is available, if there is number 0 in the bag, and after event have been done there is one number 0 less in the bag
   - *out1* is available, if there is number 1 in the bag, and after event have been done there is one number 1 less in the bag
   - *in0* adds number 0 in the bag
   - *in1* adds number 1 in the bag
   - if the bag is full neither of the adding operations is available

5. Specify the following data communication channel as a labelled transition system.

   - There is a one-way traffic in the channel
   - It takes messages a and b and gives them to the receiver.
   - Messages can get lost in the channel
   - In the channel there can be not more than two messages at same time.
   - The order of the messages can change in the channel.