Introduction to Model Checking
Winter term 2011/2012

– Series 9 –

Hand in on December 21$^{\text{th}}$ before the exercise class.

Exercise 1 (4 points)

Consider an elevator system that services $N > 0$ floors numbered 0 through $N - 1$. There is an elevator door at each floor with a call-button and an indicator light that signals whether or not the elevator has been called. For simplicity consider $N = 4$. Present a set of atomic propositions - try to minimize the number of propositions - that are needed to describe the following properties of the elevator system as LTL formula and give the corresponding LTL formulae:

a) The doors are "safe", i.e., a floor door is never open if the elevator is not present at the given floor.

b) A requested floor will be served sometime.

c) Again and again the elevator returns to floor 0.

d) When the top floor is requested, the elevator serves it immediately and does not stop on the way there.

Exercise 2 (2 + 2 + 2 points)

Let φ and ψ be LTL formulae. Consider the following new operators:

a) "At next" $\varphi N \psi$: at the next time where ψ holds, φ also holds.

b) "While" $\varphi W \psi$: φ holds at least as long as ψ does.

c) "Before" $\varphi B \psi$: if ψ holds sometime, φ does so before.

Make the definitions of these informally explained operators precise by providing LTL formulae that formalize their intuitive meanings.