ALBERT-LUDWIGS-
UNIVERSITÄT FREIBURG

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Tutorials for Cyber-Physical Systems I - Model Checking
Exercise sheet 6

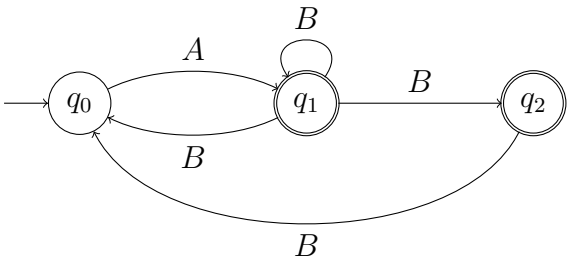
Each year, a certain family has the same discussion: the father, a German, wants to open the presents on Christmas Eve, the mother, a French, wants to open the presents on the morning of Christmas Day. We let you guess how the discussion ends each year. In the meantime, contemplate the following two statements.

(a) In infinitely many years, presents are opened on Christmas Eve or Christmas Day.

(b) In infinitely many years, presents are opened on Christmas Eve or in infinitely many years, presents are opened on Christmas Day.

Clearly, (b) implies (a). What about the converse? And does this little Christmas tale have something to do with Exercise 3?

Exercise 1: From GNBA to NBA
Consider the GNBA outlined below with acceptance sets $F_1 = \{q_1\}$ and $F_2 = \{q_2\}$. Construct an equivalent NBA.



Exercise 2: GNBA
Provide NBA $\mathcal{A}_1$ and $\mathcal{A}_2$ for the languages given by the expressions $(AC + B)^*B^\omega$ and $(B^*AC)^\omega$ and apply the product construction to obtain a GNBA $\mathcal{G}$ with $\mathcal{L}_\omega(\mathcal{G}) = \mathcal{L}_\omega(\mathcal{A}_1) \cap \mathcal{L}_\omega(\mathcal{A}_1)$ Justify that $\mathcal{L}_\omega(\mathcal{G}) = \varnothing$.

Exercise 3: Closure of Büchi-Automata
Given two total DBAs $\mathcal{A}_1$ and $\mathcal{A}_2$, construct a total DBA that recognizes $\mathcal{A}_1 \cup \mathcal{A}_2$.
Hint: Use a product automaton as for intersection, only with different accepting states.

Exercise 4: Lecture Evaluation (optional)
We would like to make sure you are following the lecture and having fun at the same time.

(a) What is good about the lecture? (one sentence) What is bad about the lecture? (one page)

(b) What are the two or three main concepts from the last two lectures, and how are they related?