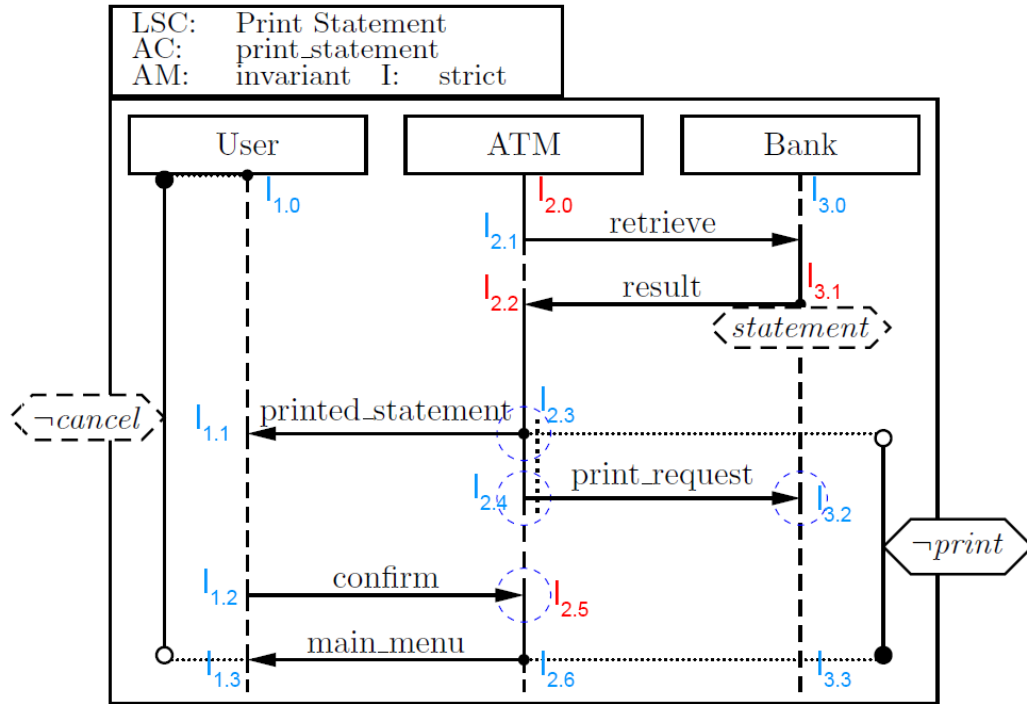


Solutions for Exercise sheet 4

Exercise 1 – LCS Syntax and Semantics

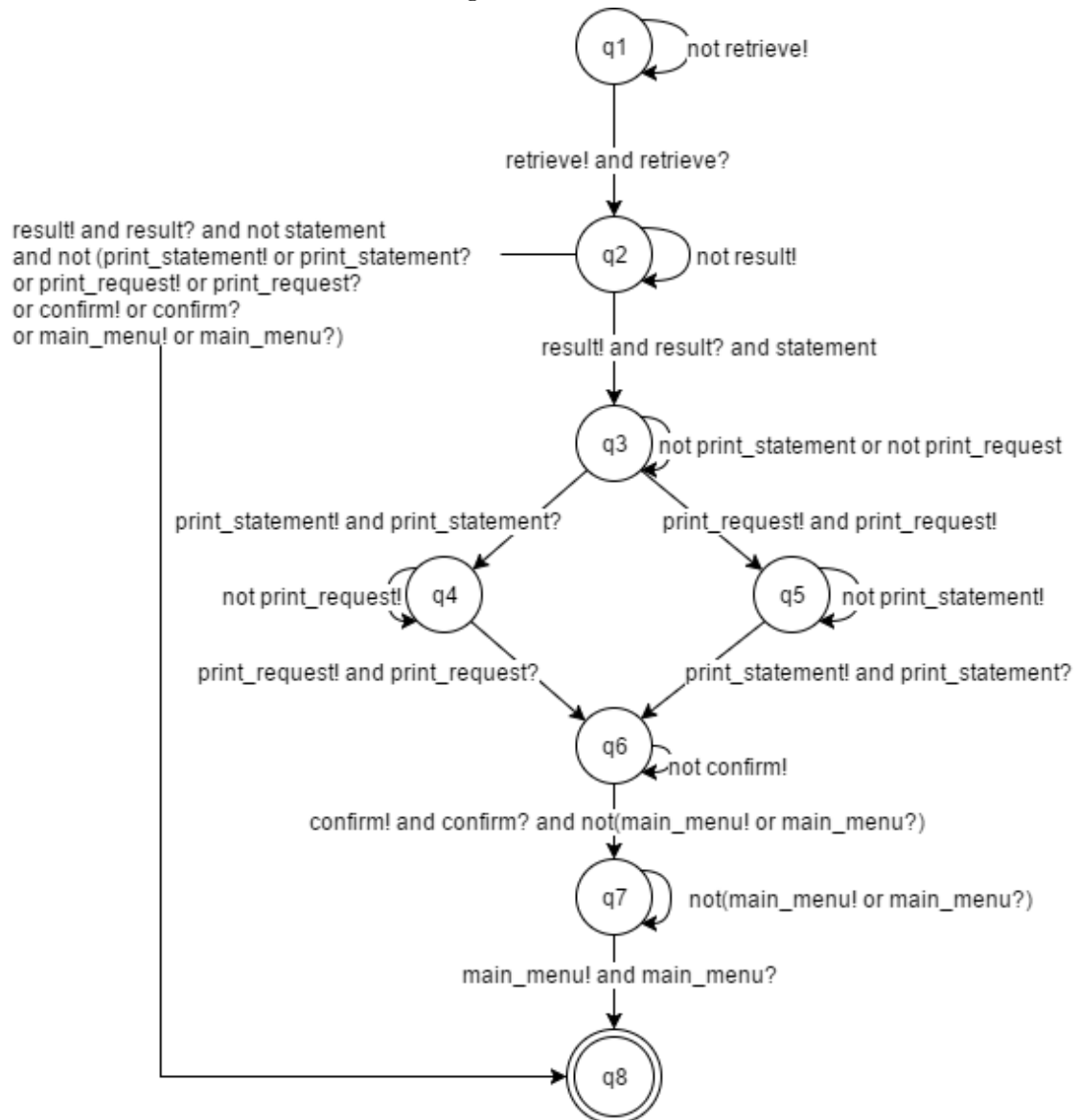
(i) LCS:



- a) $\mathcal{L} = \{l_{1.0}, l_{1.1}, l_{1.2}, l_{1.3}, l_{2.0}, l_{2.1}, l_{2.2}, l_{2.3}, l_{2.4}, l_{2.5}, l_{2.6}, l_{3.0}, l_{3.1}, l_{3.2}, l_{3.3}\}$
- b) $\mathcal{I} = \{\{l_{1.0}, l_{1.1}, l_{1.2}, l_{1.3}\}, \{l_{2.0}, l_{2.1}, l_{2.2}, l_{2.3}, l_{2.4}, l_{2.5}, l_{2.6}\}, \{l_{3.0}, l_{3.1}, l_{3.2}, l_{3.3}\}\}$
- c) $l_{2.4} \sim l_{3.3}, l_{2.3} \preceq l_{2.5}, l_{2.4} \preceq l_{2.5}$
- d) $\text{Msg: } \{(l_{2.1}, \text{retrieve}, l_{3.1})\}$
- e) $\text{Inv: } \{l_{1.0}, \bullet, \neg\text{cancel}, l_{1.3}, \circ\}$
- f) $\text{Cond: } \{(\{l_{3.2}\}, \text{statement})\}$

- (ii) $c_1 = \{l_{1.0}, l_{2.0}, l_{3.0}\}$
 $c_2 = c_1 \cup \{l_{2.1}, l_{3.1}\}$
 $c_3 = c_2 \cup \{l_{2.2}, l_{3.2}\}$
 $c_4 = c_3 \cup \{l_{2.3}, l_{1.1}\}$
 $c_5 = c_3 \cup \{l_{2.4}, l_{3.3}\}$
 $c_6 = c_3 \cup \{l_{2.3}, l_{1.1}, l_{2.4}, l_{3.3}\}$
 $c_7 = c_6 \cup \{l_{1.2}, l_{2.5}\}$
 $c_8 = c_7 \cup \{l_{2.6}, l_{1.3}\}$

Abbildung 1: Büchi automaton

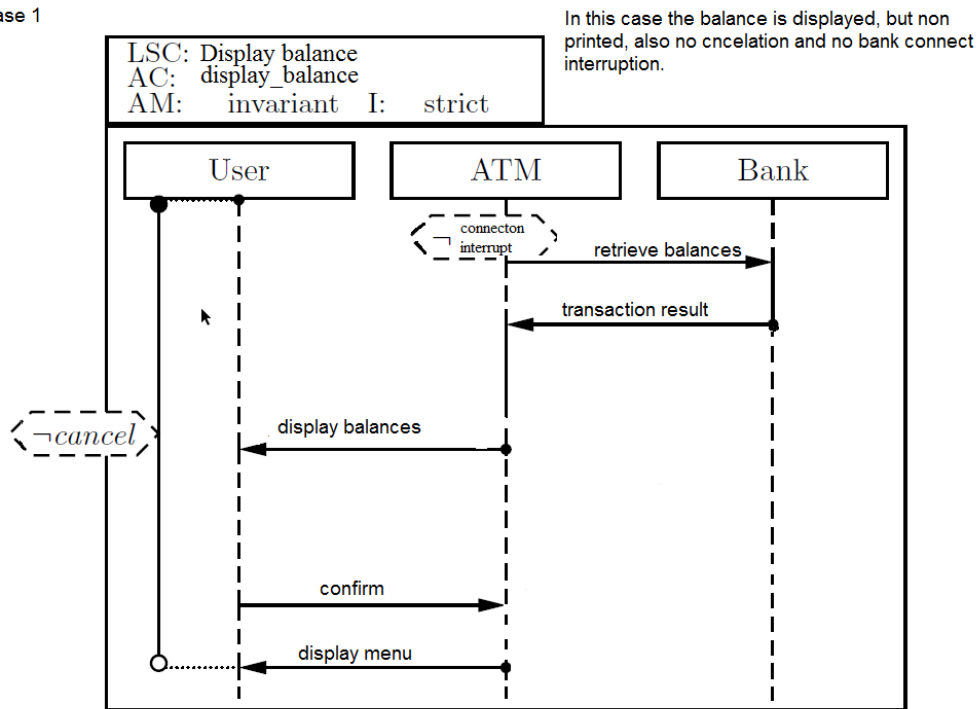


(iii) Strictness conditions omitted for readability.

- a) $\pi_{accept} = c_1 \xrightarrow{retrieve! \wedge retrieve?} c_2 \xrightarrow{result! \wedge result? \wedge statement} c_3 \xrightarrow{print-statement! \wedge print-statement?} c_4 \xrightarrow{print-request! \wedge print-request?} c_6 \xrightarrow{confirm! \wedge confirm?} c_7 \xrightarrow{main-menu! \wedge main-menu?} c_8$
- b) $\pi_{exit} = c_1 \xrightarrow{retrieve! \wedge retrieve?} c_2 \xrightarrow{result! \wedge result? \wedge \neg statement} c_8$
- c) $\pi_{violate} = c_1 \xrightarrow{retrieve! \wedge retrieve?} c_2 \xrightarrow{result! \wedge result? \wedge statement} c_3 \xrightarrow{print-statement! \wedge print-statement?} c_4 \xrightarrow{print-request! \wedge print-request? \wedge print} illegal$

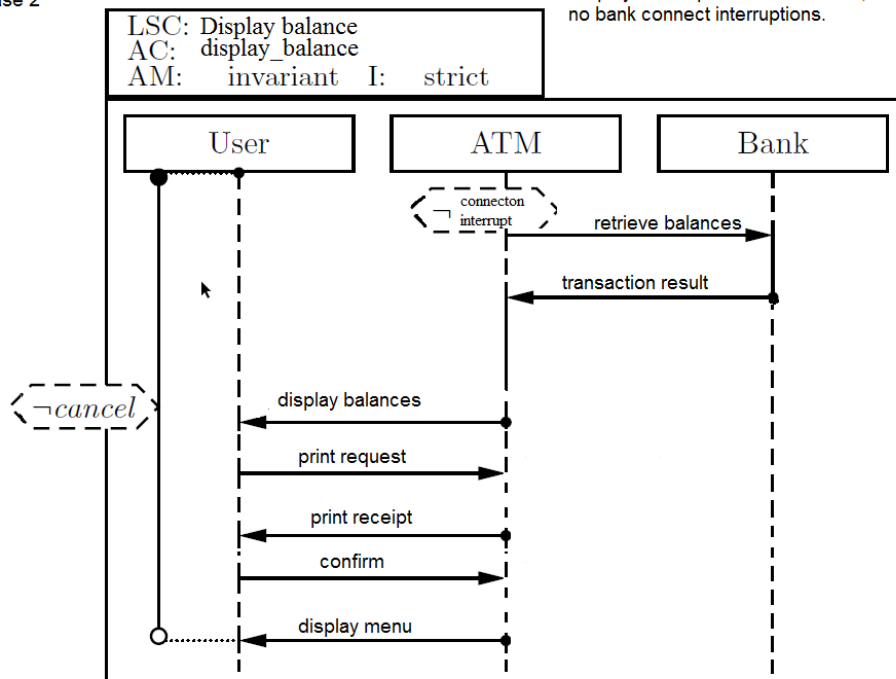
Exercise 2

Case 1



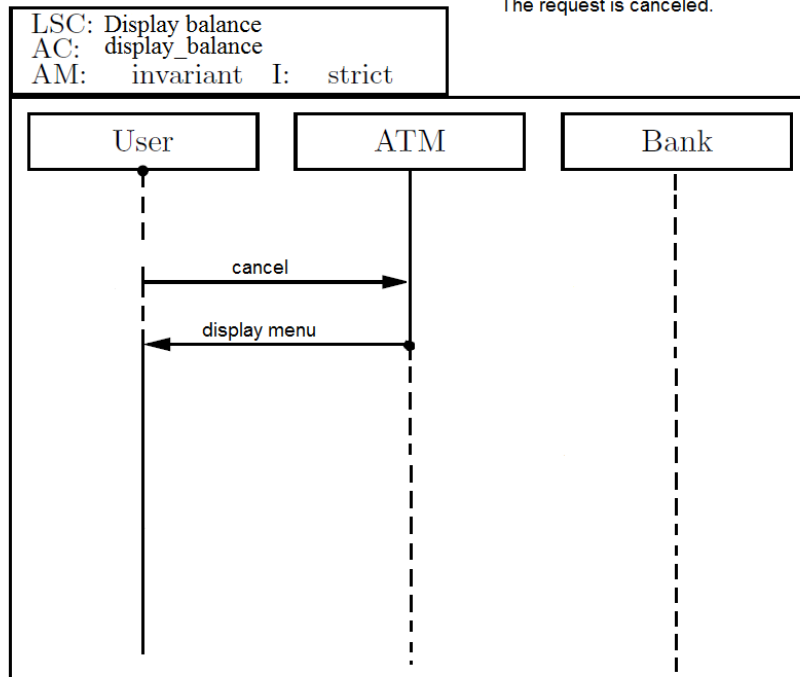
Case 2

Displayed and printed the balance, no cancelations and no bank connect interruptions.



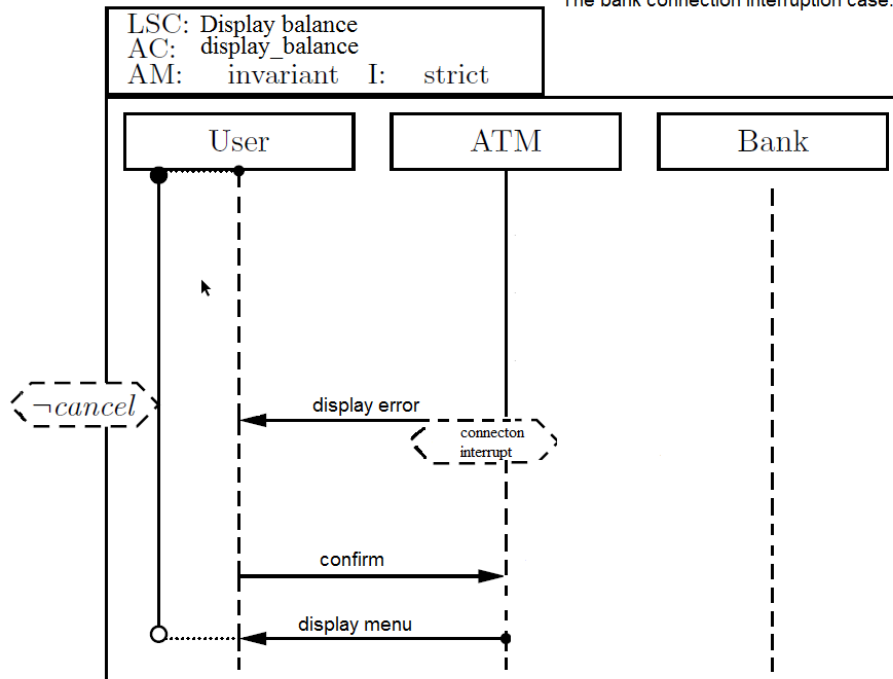
Case 3

The request is canceled.



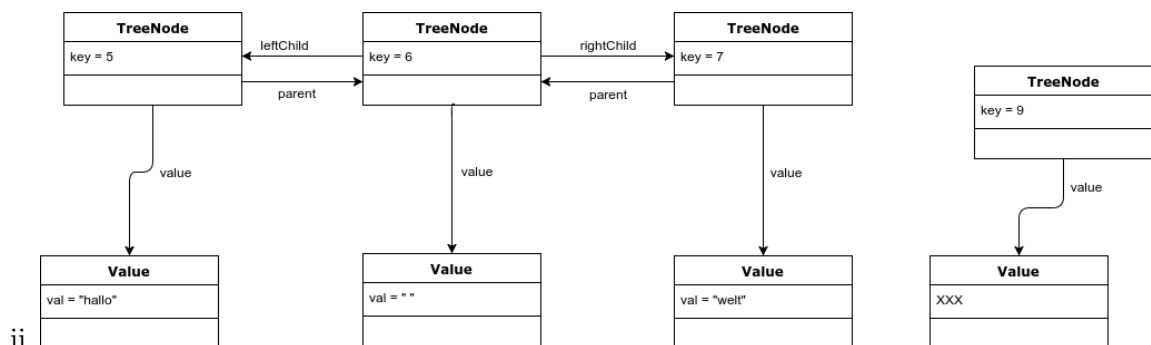
Case 4

The bank connection interruption case.



Exercise 3

- i $\mathcal{S} = (\mathcal{T}, \mathcal{C}, V, atr, F, mth)$ mit
 $\mathcal{T} = \{int\}$
 $\mathcal{C} = \{TreeNode, Object\}$
 $V = \{key : int, leftChild : TreeNode, rightChild : TreeNode, parent : TreeNode, value : Object\}$
 $atr = \{TreeNode \mapsto \{key, leftChild, rightChild, parent, value\}, Object \mapsto \emptyset\}$
 $F = \{\emptyset\}$
 $mth = \{TreeNode \mapsto \emptyset, Object \mapsto \emptyset\}$



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