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Concurrency Theory WS 2019/2020

— Exercise 2 —

Hand in until October 24th before the exercise class.

Exercise 1 (30+10+20 Points)

Consider the following tasks on CCS and corresponding LTS.

(a) Decide whether the following CCS process definitions induce infinite LTS and whether their trace languages are regular. Justify your answers.

i) $B = (B \parallel B) + a.\mathrm{nil}$

ii) $D = a.(D \parallel b.\mathrm{nil})$

iii) $B = (B \parallel B) \setminus \{a\} + a.\mathrm{nil}$

(b) Prove or disprove: If a CCS process C is defined as $C = C \parallel P$ for some process expression P, then $\mathrm{LTS}(C)$ is infinite.

(c) Prove or disprove: If a CCS process C is defined as $C = a.C \parallel P$ for some process expression P, then $\mathrm{LTS}(C)$ is infinite.

Exercise 2 (20 Points)

Let $A = \langle a \rangle(\langle b \rangle \mathtt{tt} \vee \langle c \rangle \mathtt{ff})$ and $B = [a](\langle b \rangle \mathtt{tt} \wedge [c]\mathtt{ff})$ be HML formulae.

(a) Give a CCS expression (or LTS) for which A holds but not B.

(b) Give a CCS expression (or LTS) for which B holds but not A.

Exercise 3 (20 Points)

Let F be a label and $A = \langle a \rangle F$ and $B = [a]F$ be HML formulae.
Give minimal (w.r.t. the number of states) LTS L_1, L_2, L_3 and L_4 such that

(a) $L_1 \models A$ and $L_1 \models B$,

(b) $L_2 \models A$ and $L_2 \not\models B$,

(c) $L_3 \not\models A$ and $L_3 \models B$ and

(d) $L_4 \not\models A$ and $L_4 \not\models B$.