Formale Übersetzungsmodelle

Task 23 (Baker's theorem for BOT***)***

Consider Baker's theorem for BOT:

> **Theorem** [Bak79, Thm. 6]. Let B_1 and B_2 be bu-tt. Then $\tau(B_1) \circ \tau(B_2) \in \mathsf{BOT}$ if the following two conditions hold:
>
> 1. B_1 is linear or B_2 is deterministic;
> 2. B_1 is nondeleting or B_2 is total.

(a) Give two bu-tt B'_1 and B'_2 that fulfill Condition 1 but not Condition 2. Give two bu-tt B''_1 and B''_2 that do not fulfill Condition 1 but fulfill Condition 2. For each bu-tt use the minimum number of rules necessary.

(b) Construct the instance B' and B'' (for B'_1 and B'_2, and B''_1 and B''_2, respectively) of the bu-tt B defined in the proof (from the lecture) of the above theorem.

(c) Give trees s', t', s'', t'' such that

(i) $\neg((s', t') \in \tau(B'_1) \circ \tau(B'_2) \iff (s', t') \in \tau(B'))$ and

(ii) $\neg((s'', t'') \in \tau(B''_1) \circ \tau(B''_2) \iff (s'', t'') \in \tau(B''))$.

(d) Prove the following corollary:

> **Corollary**. Let B_1 and B_2 be bu-tt. Then $\tau(B_1) \circ \tau(B_2) \in \mathsf{BOT}$ if B_1 is linear or B_2 is deterministic.

(e) Apply the above corollary to B''_1 and B''_2 from Task 23 (a).

References

[Bak79] B. S. Baker. "Composition of top-down and bottom-up tree transductions". In: *Information and Control* 41.2 (1979), pp. 186–213. issn: 0019-9958. doi: `10.1016/S0019-9958(79)90561-8`.

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