11. Übung (7. Januar 2016)

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 $\tau(B_1) \circ \tau(B_2) \in \text{BOT}$ 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 $\tau(B_1) \circ \tau(B_2) \in \text{BOT}$ 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**