Errata Theorie van Concurrency

The errata marked YG were discovered by Yan Gao, December 2003.

– page 6, line 5. Change "$n \geq 1$" into "$n \geq 2$".

YG– page 44, lines 16/17. It is claimed here that removal of p or q results in an EN system that is configuration equivalent with M. This is only correct if it is assumed that M is reduced (which we may assume by Theorem 36). In that case p and q are either both in C_{in} or both not in C_{in}. A counterexample for the non-reduced case is the EN system M with transitions s, t, places p, q, r_1, r_2, $C_{in} = \{r_1, p\}$, and ${}^\bullet s = \{r_1\}$, $s^\bullet = {}^\bullet t = \{p, q\}$, $t^\bullet = \{r_2\}$.

– page 64. Replace the proof of **Lemma 72** by the following proof: Let $L = \{a_1, \dots, a_k\}$ with $a_1 \,\rho\, a_2 \,\rho \cdots \rho\, a_k$. Since A is nonempty, L is nonempty and so $k \geq 1$. Then $a_1 \in {}^\circ N$, because otherwise there exists $a_0 \in A$ such that $a_0 \,\rho\, a_1$, and so $L \cup \{a_0\}$ would be a **li**-clique and L would not be maximal. Similarly $a_k \in N^\circ$.

– Replace Lemma 82 by the following sentence and new Lemma 82:

We first show that lines correpond to paths from ${}^\circ N$ to N°.

Lemma 82. Let $N = (P, T, F, {}^\circ N)$ be a process net with $P \neq \emptyset$, and let $L \subseteq X = P \cup T$. Then L is line of N iff there exist $x_1, \dots, x_k \in X$, $k \geq 1$, such that (1) $L = \{x_1, \dots, x_k\}$, (2) $x_1 \in {}^\circ N$ and $x_k \in N^\circ$, and (3) $x_i \,F\, x_{i+1}$ for every $1 \leq i \leq k-1$.

Proof. ($\Rightarrow$) Let L be a line of N, and let $L = \{x_1, \dots, x_k\}$ with $x_1 \,F^+\, x_2 \,F^+ \cdots F^+\, x_k$. Since $P \neq \emptyset$, L is nonempty and so $k \geq 1$. By Lemma 72, $x_1 \in {}^\circ N$ and $x_k \in N^\circ$. To prove (3), suppose that not $x_i \,F\, x_{i+1}$. Then there exists $y \in X$ such that $x_i \,F^+\, y \,F^+\, x_{i+1}$, and so $L \cup \{y\}$ is a **li**-clique, contradicting the maximality of L.

($\Leftarrow$) Obviously, by (1) and (3), L is a **li**-clique. Suppose now that there is a $y \in X - L$ such that $L \cup \{y\}$ is a **li**-clique. Consider the "position" of y in the sequence $x_1 \,F^+\, x_2 \,F^+ \cdots F^+\, x_k$. Then either $y \,F^+\, x_1$ (which is impossible because $x_1 \in {}^\circ N$) or $x_k \,F^+\, y$ (which is impossible because $x_k \in N^\circ$) or $x_i \,F^+\, y \,F^+\, x_{i+1}$ for some $1 \leq i \leq k-1$. The last case is also impossible. In fact, in that case there exists $z \in X$ such that $x_i \,F\, z \,F^*\, y$. Thus, if $x_i \in P$, then $x_i{}^\bullet$ contains both z and x_{i+1}, contradicting Definition 73(2). Otherwise, $x_{i+1} \in P$ and we get a similar contradiction by considering $z' \in X$ such that $y \,F^*\, z' \,F\, x_{i+1}$.
End of proof.

YG– Replace the proof of **Theorem 83** by the following proof:

Proof. (1) Let M be a sequential component of N, and let $S = P_M$. Note that N is reduced, by Theorem 81(1). Using the characterization of a sequential component in Theorem 49(3), it easily follows that X_M contains a nonempty set $L = \{x_1, \dots, x_k\}$ satisfying the conditions of (the new) Lemma 82, i.e., L is a line. To show that $L = X_M$, let $y \in X_M$. By the same characterization, used "backwards", X_M must contain $y_1, \dots, y_m$ such that $y_1 \in {}^\circ N$, $y_1 \,F\, y_2 \,F \cdots F\, y_m$, and $y_m = y$ (i.e., a path from ${}^\circ N$ to y). Since M contains at most one element of ${}^\circ N$ by Theorem 4.9(3)(i), we get that $y_1 = x_1$. Since $y_1{}^\bullet = x_1{}^\bullet$ is a singleton by Definition 73(2), we get that $y_2 = x_2$. Since $\#(y_2{}^\bullet \cap S) = 1$ by Theorem 4.9(3)(ii), we get that $y_3 = x_3$. Continuing like this we finally obtain that $y_m = x_m$ and so $y \in X_M$.

(2) Let $L = \{x_1, \dots, x_k\}$ as in (the new) Lemma 82. Using Theorem 49(3) it is easy to check that $S = L \cap P$ determines a sequential component: $(C_{in})_N \cap S = {}^\circ N \cap S = \{x_1\}$, $\#({}^\bullet t \cap S) = \#(t^\bullet \cap S) = 1$ for all $t \in L \cap T$, and finally $\#({}^\bullet t \cap S) = \#(t^\bullet \cap S) = 0$ for all $t \in T - L$ because of Definition 73(2) and the definition of ${}^\circ N$ and N°. From Lemma 46(1) it follows that S determines the sequential component as described in the statement of this theorem. In particular, its transitions are $\mathbf{nbh}_N(S) = L \cap T$ by Definition 73(2).
End of proof.

- page 69, 4th line of the proof of Theorem 84. Change "Lemma 82(2)" into "Lemma 82".
- page 82. Replace the induction-part of the proof of **Theorem 101** by the following direct proof:

  Consider a path from v to w. Since the graph is acyclic, all nodes of the path are distinct. If the path contains a transitive edge (x, y), replace that edge by a path of length ≥ 2 from x to y. By repeating this transformation, the path from v to w becomes longer and longer. Thus, since G is finite, the repetition has to stop and the resulting path from v to w contains nontransitive edges only.
- page 82, 2nd line after the proof of Theorem 102. Change T_M into $\mathbf{use}(T_M)$.
- page 86, 2nd line before Lemma 108. Again, change T_M into $\mathbf{use}(T_M)$.
- page 115, 4th line after Definition 156. Change "$W(x, y) \leq 1$" into "$W(x, y) = 1$".

YG– page 120, line 2. Change "Then after $|x|$ iterations" into "Suppose $C_{in}[y\rangle C$. Then after at most $|y| + |x|$ iterations".
- page 129, Theorem 187. Change "configuration" into "transition".
- page 140, 2nd line of the proof of Lemma 203. Remove "since M is a marked graph". This fact is needed for both cases, not only the second case.
- page 141. Alternative proof of **Theorem 204, (3) ⇒ (1)**:

  Assume that $C_{in}(\alpha) > 0$ for every cycle α. We will prove that M is live. Clearly, it suffices to prove that for every configuration $C \in \mathbb{C}_M$ there is a firing sequence $x \in T^*$ such that $C[x\rangle_M C$ and every transition of T occurs in x. Consider an arbitrary $C \in \mathbb{C}_M$. By Lemma 203(2), $C(\alpha) > 0$ for every cycle α. Construct the net $N = (P', T, F')$ from M by changing every place $p \in P$ with $C(p) > 0$ into two places p_1 and p_2, with ${}^\bullet p_1 = {}^\bullet p$, $p_1{}^\bullet = \emptyset$, ${}^\bullet p_2 = \emptyset$, and $p_2{}^\bullet = p^\bullet$. Since every cycle of M is marked by C, N is acyclic. Moreover, since M is a marked graph, every place of N has at most one input transition and at most one output transition. Hence, N is a process net. By Theorem 112 there exists $x \in T^*$ such that ${}^\circ N[x\rangle N^\circ$ and every transition of T occurs (exactly once) in x. Obviously, this implies that $C[x\rangle_M C$.