Erratum

“Compositionality of projection inheritance”

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Theorem 40 (compositionality of projection inheritance) is one of the central theorems in the paper “Component-based software architectures: a framework based on inheritance of behavior” (cf. [2, pp. 157–158]). This theorem states that, given certain requirements, a component can be replaced by another component which is a subclass without changing the overall behavior of the system. This is indeed the case. However, Theorem 40 also states that the resulting system is sound (i.e., proper termination, absence of deadlocks, etc.). Note that a strong notion of soundness is used. This notion of soundness does not allow for dead transitions (transitions which can never be activated). Unfortunately, the requirements of Theorem 40 do not imply the absence of dead transitions in the newly added component. A counter example for the theorem as it is formulated in [2] is shown in the figure.

The C-net composed of \( N_A \) and \( N_B \) is a sound C-net in the spirit of Theorem 40. Moreover, both \( N_B \) and \( N_C \) correspond to sound C-nets and \( N_C \) is a subclass of \( N_B \) under projection inheritance [1]. (In fact, \( N_B \) and \( N_C \) are branching bisimilar.) If \( N_B \) is replaced by \( N_C \), then, according to Theorem 40, the resulting C-net should be sound and a subclass of the original C-net composed of \( N_A \) and \( N_B \). The resulting C-net is indeed a subclass of the original C-net and the first three requirements stated in Definition 16 (soundness) hold. Unfortunately, the resulting net is (formally) not sound since the bottom two transitions \( f \) and \( g \) are dead and the fourth requirement stated in Definition 16 excludes dead transitions. Note that this is a surprising, but not essential, problem which can be repaired easily. First of all, it is possible to use weak soundness (i.e., without the fourth requirement) rather than soundness. Second, it is possible to remove dead transitions whenever C-nets are composed from other C-nets. Note that it is easy to see that these modifications do not compromise the validity

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of the other proofs since dead transitions do neither enable new behavior nor disable existing behavior.

References
