Addendum to:
Pushing Optimal ABox Repair from $\mathcal{EL}$ Towards More Expressive Horn-DLs

Franz Baader , Francesco Kriegel
Theoretical Computer Science, Technische Universität Dresden, Dresden, Germany
{franz.baader,francesco.kriegel}@tu-dresden.de

In the following, (C) refers to the conference version (Baader, Kriegel, 2022a) and (E) refers to the extended version (Baader, Kriegel, 2022b).

1. In Example III in (E), the concept description $\exists r.\exists r^-.\exists r^-.A$ must be used in place of $\exists r.\exists r^-.A$. Likewise in the second paragraph: the concept description $\exists r^m.\exists r^-.A$ must be replaced with one that contains more occurrences of the inverse r^- than of r, say $\exists r^m.\exists (r^-)^{m+1}.A$. (We thank Adrian Nuradiansyah for reporting that this example is erroneous.)
2. In Proposition V in (E), the initial state of the finite automaton $\mathfrak{B}$ must be $i \coloneqq (t, q)$. The state q used in the definition of the transition relation Δ need not be the one in the considered existential restriction $\exists q.C$, and therefore we should rather set $\Delta \coloneqq \{\ ((u,o),R,(v,p)) \mid R(u,v) \in \mathcal{B} \text{ and } (o,R,p) \in \Delta_R\ \}$.
3. The Example 10 both in (C) and (E) is correct, but with a slight modification we can also show that not every repair is entailed by an optimal one. Actually, this modification was presented in the conference talk.

   Consider
   - the qABox $\exists\emptyset.\{r(a,a),\ s(a,a),\ A(a),\ B(a)\}$,
   - the TBox $\{\exists s.A \sqsubseteq A,\ \exists s.B \sqsubseteq B\}$,
   - the RBox $\{r \circ s \circ r^- \sqsubseteq s\}$,
   - and the (global) repair request $\{A \sqcap B\}$.

   The terminology is terminating, but the RBox is not regular. It is easy to verify that, for each number $n \geq 2$, the qABox $\exists X_n.\mathcal{A}_n$ is a repair where $X_n \coloneqq \{x_1, \ldots, x_n\}$ and

   $$\begin{aligned}\mathcal{A}_n \coloneqq \{&A(a), \quad B(x_1), \quad \ldots, B(x_n),\\ &r(a,x_1), r(x_1,x_2), \ \ldots, r(x_{n-1},x_n)\\ &s(a,a), \quad s(x_1,x_1), \ \ldots, s(x_n,x_n)\}\end{aligned}$$

   Now assume that $\exists Y.\mathcal{B}$ is an optimal repair that entails $\exists X_n.\mathcal{A}_n$ for some $n \geq 2$. W.l.o.g. let $\exists Y.\mathcal{B}$ be saturated and consider a homomorphism h from $\exists X_n.\mathcal{A}_n$ to $\exists Y.\mathcal{B}$.

   If there were two indices $i < j$ with $h(x_i) = h(x_j)$, then the matrix $\mathcal{B}$ would contain the role assertion $s(h(x_{i-1}), h(x_{j-1}))$, since it already contains $r(h(x_{i-1}), h(x_i))$, $s(h(x_i), h(x_i))$, $r(h(x_{j-1}), h(x_i))$ and it is saturated especially w.r.t. the RI $r \circ s \circ r^- \sqsubseteq s$. By means of the RI, we could shift the first object in this role assertion back along the r-assertions towards the individual a while shifting the second object within the r-cycle $h(x_i), \ldots, h(x_{j-1})$, such that we eventually infer that the matrix $\mathcal{B}$ would contain the role assertion $s(a, h(x_k))$ for some $i \leq k < j$. But then the concept name B would be propagated from $h(x_k)$ to a by means of the CI $\exists s.B \sqsubseteq B$, i.e., the individual a would be an instance of both A and B, a contradiction.

   So, we can assume that n is maximal such that $\exists Y.\mathcal{B}$ entails $\exists X_n.\mathcal{A}_n$. We extend $\exists Y.\mathcal{B}$ by a fresh variable y and the assertions $r(h(x_n), y)$, $s(y,y)$, $B(y)$ and denote the resulting qABox by $\exists Y'.\mathcal{B}'$. Obviously, $\exists Y'.\mathcal{B}'$ entails $\exists Y.\mathcal{B}$ but not vice versa (since $\exists Y.\mathcal{B}$ is already saturated and does not entail $\exists X_{n+1}.\mathcal{A}_{n+1}$ by assumption). Moreover, $\exists Y'.\mathcal{B}'$ is already saturated: as y has no further successors, the RI is not applicable, and the CIs are not applicable as well. Since $\exists Y'.\mathcal{B}'$ does not contain objects that are instances of $A \sqcap B$, we conclude that it is also repair, which contradicts the assumed optimality of $\exists Y.\mathcal{B}$.

   Last, remark that we could dispense with the first CI and use the local repair request $\{(A \sqcap B)(a)\}$ instead of the global one.
4. Not an error but a simplification in Definition XI in (E) could be to remove Conditions (RA3) and (RA5), since both already follow from (RT2), (RA2), and (RA4).
5. In (E) in the last paragraph of Section 3.2, we forgot to mention that the repair request $\mathcal{P}$ must not have a global part since the referenced LTCS-Report 21-01 only considers such requests. (We thank Adrian Nuradiansyah for asking whether this formulation is correct.)
6. In (E) in the heading of Section 3.5 the phrase "in polynomial time" should be replaced with "in polynomial user time" or "in polynomially many steps."
7. In (E) in the proof of Lemma XXXII, the sentence "Since the user did not ignore any assertion, she or he must have rejected $C(a)$ and so the (enlarged) repair request $\mathcal{Q}$ contains $C(a)$." must be replaced with "It follows that either $\mathcal{B} \cup \{C(a)\}$ violates $\mathcal{Q}$ and so $C(a)$ is automatically rejected or, since the user did not ignore any assertion, she or he must have rejected $C(a)$. In both cases, the (enlarged) repair request $\mathcal{Q}$ contains $C(a)$."
8. It is no error, but both in (C) and (E) in Definition 21, the

name "$\mathcal{ELRO}\mathcal{I}$ rewriting" could be replaced with "$\mathcal{ELO}\mathcal{I}$ rewriting" since no role inclusions are involved.

9. Proof of Proposition 22 in (E): in the Individual Rule, specifically in the definition of F_{i+1}, the edge $\{[x], [t]\}$ must be replaced with $\{[a], [t]\}$.

   Furthermore, in Case 2 of the proof of the claim, we assume w.l.o.g. that the path q'' is maximal, i.e., there is no path between q'' and p_2 that ends with an individual class. (Then, before the construction of p_2 can be completed, rule application is stopped at q'' or earlier, until p_1 has been constructed and the Individual Rule has been applied to $[x]$.)

   The argumentation in Case 3 is not fully correct. It might be that also earlier further successors of $[a]$ are added. But this is not problematic. The point is: the construction of p_1 finishes earlier and no matter how far p_2 has been constructed until then, the Variable Rule will first be applied to $[x]$, leaving no edges involving $[x]$ left over. Specifically, whenever the construction of the path p_1 is interrupted by reaching an individual class and then continuing the construction of p_2 from the last individual class, another individual class must be reached before p_2 could be fully constructed (otherwise the construction of p_2 would finish earlier due to the rule precedence, a contradiction). Since in the end p_1 is constructed first, the construction of p_2 must be interrupted at an individual class, and thus the Individual Rule will be applied to $[x]$ before the construction of p_2 is completed.

10. On Page 34 below the heading in (E), the sentence "A regular path expression is a regular path expression over roles." must be replaced with "A regular path expression is a regular expression over roles."

References

Franz Baader, Francesco Kriegel (2022a). Pushing Optimal ABox Repair from $\mathcal{EL}$ Towards More Expressive Horn-DLs. In: *Proceedings of the 19th International Conference on Principles of Knowledge Representation and Reasoning, KR 2022, Haifa, Israel, July 31 – August 5, 2022*. Ed. by Gabriele Kern-Isberner, Gerhard Lakemeyer, Thomas Meyer, pp. 22–32. DOI: 10.24963/kr.2022/3.

Franz Baader, Francesco Kriegel (2022b). *Pushing Optimal ABox Repair from $\mathcal{EL}$ Towards More Expressive Horn-DLs (Extended Version)*. LTCS-Report 22-02. Dresden, Germany: Chair of Automata Theory, Institute of Theoretical Computer Science, Technische Universität Dresden. DOI: 10.25368/2022.131.