Review report for the paper 'Annotated Natural Deduction for Adaptive Reasoning'

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1 Introduction

This paper presents sequent style proofs for a specific paraconsistent adaptive logic ($\mathbf{CLuN^r}$) and some philosophical reflections related to Classical Recapture of paraconsistent logics.

2 General appreciation

acceptable after major revisions

3 General remarks

- The approach is sufficiently original and interesting to deserve publication.
- Largely the presented proof system seems sound and complete (apart from the detailed remarks below), but a convincing meta-proof of this is lacking.
- The English language is good and the paper is well written.
- The example proofs are useful and well chosen. Some more complex examples (e.g. cases where a formula is considered not derived at a stage, at a later stage derived, then underived again and finally considered derived) would be beneficial. It would then be more clearly illustrated how the proposed system represents the dynamic nature of adaptive logic.

4 Detailed remarks

1. Why is the system restricted to adaptive CLuN with the Reliability strategy? One of the strengths of adaptive logic is its unifying character, i.e. many defeasible reasoning forms can be formalized within the same format. Here it is not immediately clear how one could extend the results to other adaptive logics. Add suggestions how to generalize the results to other (all?) adaptive logics in standard format or motivate the choice of the particular AL. Personally I don't see why there could not be a generalized sequent calculus for all ALs in standard format.

2. There is virtually no (meta-)proof in the paper. How can we know that the new proof system for adaptive CLuN is indeed sound and complete? Theorem 2 (p. 14) seems to give some kind of hint at a proof, but what does sound and completeness even mean before the definition of Final Derivability (p.17) is given?

3. The 'context formation rules' and the 'formula formation rules' are redundant because the definitions in the text (in the metalanguage) suffice for determining what a sequent and a formula is. If the authors insist on including them, they should also be used in the example proofs.

4. The superscript ^{min} in $\phi \in \Delta^{min}$ is not sufficiently clear. Does it function as an index with the meta-variable Δ, like in Δ_2 or Δ', or is it a proof theoretic mark that is added to the object language of the proof theory? In the former case, Δ^{min} is undefined in the rule MinDab or, if Δ is supposed to be identical to Δ^{min}, then the rule does nothing at all. In the latter case, the ^{min} should also occur in the examples.

5. It is remarkable that the rule MinDab does not even occur in the examples. What is its use for the proofs?

   The way in which the variable Δ^{min} is used the proof $\mathbb{E}$ is problematic. One cannot say of a proof absolutely that $\phi \in \Delta^{min}$. First of all: this is an estimation that may change from stage to stage (depending on the Dab-formulas already derived), so it should at least be relativised to the stage of the proof. Second: there may be several independently derivable disjunctions of abnormalities, so Δ^{min} is not one unique set, but rather a set of sets. Think of the situation where you have $(p \wedge \neg p) \vee (q \wedge \neg q)$ and $s \wedge \neg s$ as premises. What would your set Δ^{min} then look like? The answer to this question cannot be 'those two formulas', because it should be a subset of Ω and the first formula is not a member of Ω. The answer cannot be the set $\{p \wedge \neg p, q \wedge \neg q, s \wedge \neg s\}$ either, because that one is not minimal.

   As a solution I would suggest to mark some lines with $^m in$ to express that they refer to lines on which minimal Dabs are derived.

   In that solution the marking rule would become

   $$\frac{\Gamma; \cdot \vdash^{min} \Delta, \phi \qquad \Gamma; \Phi, \phi^- \vdash \Delta'}{\Gamma \vdash_{\boxtimes R} \Delta'} \text{RC}$$

   But be careful: this does not yet solve what is referred to in comment 10.

6. What is special about Γ and Δ that they occur in Definition 3 and Γ' and Δ' for example not?

7. It seems that the authors have forgotten to take into account the possibility that there is more than one abnormality that is supposed to be false. The position after the semicolon on the right hand side of the sequents should thus (always) contain a (possibly empty or singleton) set, not a formula. The rules do not allow this possibility.

8. in RU2, the union ($\cup$) of two formulas is used. What does that mean? Maybe $\phi \cup \phi'$ should be interpreted as $\{\phi, \phi'\}$?

9. in RC, does one not also need to have the possibility to add an abnormality in the condition (the place after the semicolon to the left of the turnstile) if that condition is not empty? Concretely I would have expected that

   $$\frac{\Gamma; \Theta \vdash \Delta, \phi \qquad \phi \in \Omega}{\Gamma; \Theta, \phi^- \vdash \Delta}\ \mathrm{RC}$$

   or yet better

   Where $\phi \in \Omega$: $\dfrac{\Gamma; \Theta \vdash \Delta, \phi}{\Gamma; \Theta, \phi^- \vdash \Delta}\ \mathrm{RC}$

   About the latter amendment: as far as I can tell, there is no way to derive $\phi \in \Omega$ proof theoretically, so that it seems that $\phi \in \Omega$ should be purely metalinguistic. Hence there is no reason to include it in the proof.

10. Marking seems to have no effect whatsoever, except for the mentioning of some formulas that are marked. That does not make any sense compared to usual adaptive proofs. What is marked is a line, i.e. a particular way to derive a formula (so on a specific condition). It may well be that (at a stage) a formula ϕ is derivable on condition Δ_1 but not on condition Δ_2. In that case you can mark the derivation of ϕ on condition Δ_2, but not the one on condition Δ_1.

11. The marking definition for Minimal Abnormality on page 11 does not even remotely resemble the one for standard adaptive logics. I would advice the authors to just copy the original definition instead of attempting to paraphrase it. The original definition comes to not marking *a set of* derivations of a formula iff they have conditions such that for each condition there is a choice set that does not share any abnormality with that condition.

12. Top of page 14: be careful with the language: 'producing a new minimal abnormality' is very bizarre. I guess it should be 'deriving a new minimal disjunction of abnormalities' or something like that.

13. The proof on page 12: how does one obtain line/stage 7? How does $p \to \neg p$ follow from the premises?

14. In definition 5: I guess the third usage of s should have been s' where $s' < s$ or something like that.

15. Concluding remarks: the philosophical conclusion should be much more elaborated or removed from the paper. Presenting another formal proof tool for adaptive logic, does not make any philosophical difference. I fail to see how a different way to present exactly the same adaptive proofs, sheds light on deeper philosophical questions discussed in the Priest/Beall debate and on Classical Recapture.

    It is better to either remove the philosophical remarks or to seriously elaborate them.

16. Minimally inconsistent LP is not LP+minimal abnormality strategy. The difference only has an effect at the predicative level (for Minimal Abnormality the minimized elements are formulas (abnormalities), while for Minimally inconsistent LP they are objects of the domain (inconsistent

objects)), but they are nevertheless really different logics. Minimally inconsistent LP is only loosely speaking an adaptive logic, as it does not belong to the standard format of adaptive logics nor to any other broader format of adaptive logic presented in the literature.