Narrowing Down Suspicion in Inconsistent Premise Sets

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Abstract

Although the scientific enterprise is directed at obtaining a body of consistent knowledge, it is well known today that inconsistencies occurred in several central episodes of the development of scientific disciplines—see, for example, [14], [15], [17], [13], [9], [11]. In some cases a central theory—one that was superior to alternatives in vies of its problem solving capacity—was inconsistent. In other cases progress in the discipline was realized by reasoning from several central theories that are mutually inconsistent. In still other cases, progress in the discipline was realized by reasoning from a theory and a set of data that are mutually inconsistent.

The reasoning that occurs in such situations is explicated by inconsistency-adaptive logics—see, for example, [2], [1], [3], [16], [10], [18], [8], [4], [5]. These logics isolate the involved inconsistencies and in this way provide an interpretation of the premises (theories and/or data) that is as consistent as possible. Precisely this type of interpretation is needed in order to reason from the inconsistent premises and in order to regain consistency.

Inconsistency-adaptive logics provide a maximal consistent interpretation of the premises, and do not themselves resolve or eliminate inconsistencies. I have argued on several occasions that the elimination of inconsistencies is not a task for logic but has to rely on empirical data or on conceptual analysis. Although I do not want to change a bit to this position, I admit that inconsistency-adaptive logics leave the process that leads to inconsistency a mystery. The aim of the present paper is to clarify part of that mystery: on the road to consistency, logic has to play a role. A central aspect to this role will be studied in the present paper.

The adaptive consequences of many inconsistent premise sets contain disjunctions of inconsistencies even if they contain neither disjunct. A well-known and instructive propositional example is the set $\{p, q, {\sim}p \vee {\sim}q, {\sim}p \vee r, {\sim}q \vee s\}$, from which (by most adaptive logics) $(p \wedge {\sim}p) \vee (q \wedge {\sim}q)$ is derivable whereas

*The research for the present paper was supported by the Research Fund of Ghent University, by the Fund for Scientific Research – Flanders and by the Flemish Minister responsible for Science and Technology (contract BIL01/80).

neither $p \wedge \sim p$ nor $q \wedge \sim q$ is. Such premise sets state that at least one member of a set of inconsistencies is unavoidable, but does not specify this member.

Quite obviously here lies a first possibility to narrow down inconsistency. In the above example, there might be reasons to consider either p or q as not suspect. For example, the premise p might be obtained by empirical criteria that are well-entrenched in the scientific discipline, or even in a wider set of disciplines. Similarly, the 'personal constraints' of a researcher or research group might provide a reason, for this researcher or research group, to consider p as not suspect, even if a different researcher or research group may take the opposite decision—it is argued in [12] that there is noting irrational in such situations. In such cases, it is rational to consider $p \wedge \sim p$ as false, and hence to identify $q \wedge \sim q$ as the 'real' inconsistency involved in the premises. The effect on the above premises is clear. If $q \wedge \sim q$ is identified as the inconsistency involved in the above premises, r becomes derivable from them—on the adaptive logics described in [3], at best $r \vee s$ is derivable from the premises, but neither r not s is.

The proposed move does not render the premise set consistent. It narrows down the set of formulas that might be inconsistent—let us say that it soles *problem* 1. This is a sensible step towards restoring consistency. It locates the real problems, the real inconsistencies that have to be resolved in order to restore consistency. To resolve these is a different problem, call it *problem* 2, to which I briefly return in the sequel.

Having suggested intuitively a solution to problem 1, I now turn to the technical bit: to devise a logic that does the job. A naive approach is straightforward. Simply allow the problem solver to add new premises stating that certain formulas behave consistently. In the above example, $\neg(p \wedge \sim p)$ does the job—$\neg$ is classical negation whereas $\sim$ is the paraconsistent negation. Given the simplicity of the example, this leads to the desired result. In most cases, however, this approach leads to trouble. Given a predicative premise set—no real life example is propositional—from which $(A_1 \wedge \sim A_1) \vee \ldots \vee (A_n \wedge \sim A_n)$ is derivable, there may be no warrant that $A_1 \wedge \sim A_1$ is not itself derivable from the premises. Hence, if one adds the "new premise" $\neg(A_1 \wedge \sim A_1)$ and $A_1 \wedge \sim A_1$ turns out to be derivable, triviality results. So, the simplistic approach extends of the inconsistency-adaptive logic in such a way that the result is not paraconsistent. One might allow the problem solver to withdraw the premise $\neg(A_1 \wedge \sim A_1)$. This results in tinkering, not in a logic.

In some or other way, new premises that claim consistency have to be introduced in a conditional way: the *logic* should eliminate their effect if they turn out to render the (full) premise set trivial. Fortunately the means to do so are available within the adaptive tradition. To be more precise, they are provided by *prioritized* adaptive logics—see for example [6] and [5]. The idea is to introduce the new premises with a lower degree of confidence than the original one. Technically this is realized by introducing a new premise A as $\Diamond^i A$ in which $\Diamond^i$ abbreviates i occurrences of $\Diamond$ and $\Diamond^i A$ expresses a lower degree of confidence as i is larger. The prioritized adaptive logic enables one to derive A from $\Diamond^i A$ on the condition $\{\neg A \wedge \Diamond^i A\}$. The technicalities will be spelled out in the paper and the approach will be shown to be adequate.

Let me briefly return on what was called problem 2 above. A simple extension of the present approach resolves problem 2 in that, if $p \wedge \sim p$ is a consequence of the full set of premises according to the prioritized adaptive logic, the extension enables one to chose between p and $\sim p$. So, in the presence of sufficiently many new premises, the simple extension results in a consistent consequence set. This solves problem 2 from a technical point of view, but the solution is not empirically adequate. The “real” inconsistencies involved in a premise set cannot usually be eliminated by such simple means. They often reveal a conceptual problem, which can only be solved by devising a new conceptual scheme. This is a serious problem that requires a sophisticated solution, viz. one that can handle conceptual shifts. I am convinced that the problem can be solved, and that it can be solved by logical means, but not by the simplistic means available today. If logicians want logic to be taken serious, they should tackle the real challenges—this was a major impetus of the adaptive logic programme.

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