

Re: Godel's Incompleteness and Nonmonotonic Logic

Source: <http://coding.derkeiler.com/Archive/Prolog/comp.lang.prolog/2004-08/0091.html>

From: Stephan Lehmke (*Stephan.Lehmke_at_ls1.cs.uni-dortmund.de*)

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In article <1b626f1.0408241341.45b728fa@posting.google.com>, jagasian@mailinator.com (Student) writes:

>> *Does "Answer Set Logic" have anything to do with negation by failure?*

>> *To get the kind of paradox you're after, one would at least imagine*

>> *provability to have to be decidable.*

>

> *Decidability is a separate issue. The problem is that an inconsistent*

> *logic will allow for incorrect answers.*

This is not necessarily true. If the logics we're talking about are of the "negation by failure" type, then provability of $\neg F$ is defined as non-provability of F . Assuming that provability is recursively enumerable, if non-provability were also recursively enumerable, it would immediately follow that both are decidable.

If provability is known to be recursively enumerable but undecidable, as is the case for first order logic, it immediately follows that non-provability is not recursively enumerable. Hence a "logic" of "negation by failure" type is either decidable or non-axiomatisable and hence incomplete, without any reference to Goedel theorems.

Thus, even though a "logic" of "negation by failure" type might seem to be Hilbert-complete by definition, it isn't, and isn't even complete in the classical sense if provability is not decidable.

You see that inconsistency doesn't enter the picture at all.

>> *How to stitch this together with second order logics to which Goedels*

>> *incompleteness theorems refer escapes me.*

>

> *Godel's two famous theorems apply to first-order predicate logic.*

I'm not completely sure what two theorems you are referring to, but if the theorem generally known as 'the' "incompleteness theorem" is among them then this statement is clearly false.

- > See
- > Kleene's "Introduction to Metamathematics", Kleene's "Mathematical
- > Logic", or Girard's "Proof Theory and Logical Complexity : Volume I",
- > if you cannot get your hands on the Godel's original work (or a
- > translation thereof).

You are very generous with your references. I have none of them immediately available, but as they stem from respectable authors, I am sure you will find in them no claim that first-order predicate logic is in danger of being incomplete in the standard meaning of this concept.

- >> Closed world assumption, which is a more mainstream representative of
- >> the kind of nonmonotonic logics you seem to be talking about,
- >> guarantees "Hilbert completeness" only wrt ground atomic formulae.
- >
- > Well, the answer set style logics work with non-ground formula by
- > assuming a possibly infinite grounding. See "Knowledge
- > Representation, Reasoning, and Declarative Problem Solving" by Chitta
- > Baral.

It is nice to cite things, but on usenet it is considered good form to define the things one is talking about.

Maybe you could give a rigorous definition of "answer set style logics"?

regards
Stephan

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