Referee report on:

« Deconstruction of infinite extensive games using coinduction. »

by Pierre Lescanne.

Contents. Infinite games with infinite histories are defined via coinduction. Nash and Subgame perfect equilibria are then defined in this language. Two classical games (dollar auction and centipede) are then studied.

Referee's advice. I recommend to reject the paper for the reasons listed now.

First, I think that the author made a diplomatic mistake, to say the least, in submitting to IJGT a paper where it is said at the very beginning:

"from a formal point of view they [infinite extensive games] are not appropriately treated in papers and textbooks. In particular, there is no clear notion of Nash equilibrium and the gap between finiteness and infiniteness is not correctly understood."

If the mistake was only diplomatic, I would not see it as important, as candour can be forgiven.

More importanly, this indicates that the author is unaware of many (tons) of standard work in game theory where infinite games are considered. I don't even need to mention the early work on topological games (Blackwell, Martin). Having missed the huge field of infinitely repeated games and the common use of Nash and subgame perfect equilibria there, seems problematic for a paper that aims at contributing to the theory of infinite games. For instance, and contrary to what the author claims, the gap between finite and infinite games is well known to game theorists (see the contrast between Aumann-Shapley and Benoit-Krishna for a striking example). Also, while I am sympathetic to works linking game theory and computer science, I urge the author to look at the literature on verification (many representatives in France: Zielonka, Waluzievicz...) where infinite games are also common use.

Second, I do not see the contribution made to the theory and what new insights are given. The paper contains mainly definitions, that require some time to the reader to connect to standard notions (which again, exist already). These definitions are operated on two examples. It seems that the new insight here goes as follows:

In both games, 'never give up' is an equilibrium. Since nobody knows what the payoff is, if these strategies are played, there cannot exist a profitable deviation.

A standard game theoretic analysis would simply say: the game is not even well defined. I.e., what is the payoff if nobody gives up?

If the author intends at modelling a game where some situations are left unspecified (i.e. not associated to an outcome), then he should say so, and explain how this connects to rational behavior. One could argue for instance that a player expects to die before the game ends (as it never ends) and therefore stops at some point to reap some payoff. If it is this issue that the author is after, then I think it is a matter of modelling rationality in these games, and has very tenuous connections with the 'formal logic' framework of the paper.