

Metalogic: reasoning about reasoning in an interactive proof assistant

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Institution theory is the general study of logical systems using category theory. The theory has expanded since the 80s to encompass and relate a dizzying array of concrete logical systems. But the work required to induct a logical system into the theory can be tiresome—often straightforward, but repetitive, technical, and prone to error. Worse, such work suffers from the very problem which motivates abstraction: we find ourselves proving the same things over and over again. We hence build a framework in the Coq proof assistant to ease the process of designing institutions and proving facts about them. The goal is primarily to expedite the verification of those proof obligations commonly involved in constructing institutions.

We more specifically have focused efforts on formalising a semantics for the Event-B modelling language (with the first such semantics owing its existence to Marie Farrell's PhD work). The point is that if we have the syntax and semantics for Event-B represented in a proof assistant, in such a way that it can be easily connected to a broader theory of logical systems, it should be possible to formally prove many interesting facts about Event-B and its relationships to other formal methods. It appears there's some appetite for such work—Peter Rivière and the EB4EB team are doing something similar, but their philosophy is that Event-B should eat itself.

The talk will involve few details, instead consisting of a brief overview of the research area, a discussion of some recent developments in our work, and a few more points of general interest.