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Meaning explanations in Martin-Löfs Typentheorie

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Abstact:

Hilbert's program was to develop proofs of the consistency of theories for carrying out mathematics by using finitary methods. By Gödel's results we know that finitary methods do not suffice. The most general version of a revised Hilbert program would be to replace finitary methods by principles, for which we have philosophical arguments of their validity. Of course philosophical arguments are never as secure as mathematical proofs, but we know we cannot do better.

The currently both mathematically and philosophically most developed version of such a revised Hilbert program is the proof of the consistency of mathematical theories in extensions of Martin-Löf's constructive type theory. The mathematical part of this is well developed and currently we are able to carry it out for Kripke-Platek set theory extended by a Π_3-reflecting admissible, which suffices for most what is needed in mathematics.

The philosophical part of the argument is to show via Martin-Löf's meaning explanations that from a proof in type theory the validity of what is proved follows. The problem, one is always confronted with when arguing for Martin-Löf's type theory as a foundation for mathematics, is the fact that the first version of it was inconsistent: it had the principle type : type, which in modern formulations of type theory corresponds to a universe having a code for itself as an element. There has been recently a discussion on an email list about, what is wrong with meaning explanations for such a universe, but without a conclusive answer.

In this talk we will show why we can**not** give a meaning to a universe having a code for itself. Further we will show how to modify meaning explanations in order to justify the Mahlo universe.

`http://www-ls.informatik.uni-tuebingen.de/logik/Kolloquium/index.html`