Working Group 2: Type-theoretic tools (group leader: Assia Mahboubi)

Tasks:

1. Develop methods for high-level human computer communication and implement these in better user interfaces.

2. Improve library reuse and modularity.

3. Techniques for stronger proof automation using machine learning.

4. Deployment of advanced system architecture and parallelisation.

Activities:

1. In year 1: set up the Working Group; have a joint meeting; define its research agenda.

2. In years 2, 3, 4: joint meeting of the WG; report on the progress in light of the research agenda; discuss and adapt the research agenda if needed.

Milestones and Major Deliverables At the end of each year, there is a Milestone with as major deliverables:

1. Minutes of the WG meeting

2. List of output of the past year

3. Research agenda

Tools: Agda, Coq, Mizar, Matita, Idriss, Andromeda, ...

- Equality
  - Mechanizing extensionality (rules in the conversion? ad hoc support outside the theory, programming extensional equality, ...)
  - Function extensionality (adding a constructor with ad hoc reduction rules?, ...)
  - Univalence (CTT, Coq-Hott, ...)
- Side effects (via translations, direct-style, ...)
- Specification language (inductive-inductive, inductive-recursive, higher inductive types, support for mathematical "attributes", ...)
- Automation (interaction with automated theorem provers, machine learning, ...)
- Proof languages, proof methods (LCF-style, refinement-style, compact-style, actic programming languages, controlled natural language, ...)
- Libraries (coordination efforts?, ...)
- Interoperability (proof formats, autonomous proof-checkers, cross-system mapping of concepts, ...)
- Advanced system architecture (parallelization, ...)
- Interfaces (literate programming, graphical user interfaces, ...)