EuroProofNet – WG4: Libraries

Objectives:

1. investigate various approaches to efficiently maintain libraries of formal proofs
2. to make a collection of proofs that can be modified, extended, and queried . . .
3. . . . by users who do not have expert knowledge of the entire collection nor of the system that was used to develop the proofs.

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Tasks:

1. discuss challenges of maintaining and using existing libraries of formal proofs;
2. contribute to creating database of already formalised mathematics;
3. develop the tool for querying libraries of formal proofs with respect to the semantic of search object;
4. that the tool can be efficiently used with Dedukti and within software formalisation efforts.

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Deliverables:

1. (month 12): Database gathering proofs from Coq, HOL-Light and Matita and their translations.
2. (month 24): Tools for managing the dependencies between proofs, and querying and searching the database.
3. (month 48): Extension of the database and associated tools to other systems like Agda, Minlog, PVS, Lean, Mizar, Atelier B, TLAPS.

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Challenges (brainstorming):

- Library exporting and dependencies:
  - centralized approach (e.g. AFP) vs decentralized (e.g. opam)
  - what will Dedukti have? how will it manage dependencies?
  - how to trigger automatic translation to/from Dedukti?
  - when to translate between systems?

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Challenges (brainstorming):

- Library reuse:
  - type *t* in system *A* is not translated to type *t* in system *B*
    - how to declare/generate/store alignments?
    - how to transfer between *A.t* in *B* and *B.t*?
  - information how to use things is lost
    - type-classes/instances, automatically inferred arguments, coercions, canonical structures, functors, NOTATIONS, ...
    - how to declare and translate them?

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Challenges (brainstorming):

- Library indexing and querying:
  - adapt existing tools for indexing and querying up to instantiation/generalization/approximation
  - how to elaborate queries (and results)? (e.g. a query written in Coq)
  - requires alignments as well

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Challenges (brainstorming):

- Proof mining:
  - identify proofs in logical fragments (e.g. to allow more translations)
  - bring proofs in a logical fragment
  - devise new/improved translations between logics/systems