Report on the outcomes of a Short-Term Scientific Mission[1]

Action number: CA20111

Grantee name: Julien Narboux

Details of the STSM

Title:

Start and end date: 02/05/2023 to 05/05/2023

Description of the work carried out during the STSM

Description of the activities carried out during the STSM. Any deviations from the initial working plan shall also be described in this section.

(max. 500 words)

The work plan was the following:

1. *Extend the implementation of Larus to allow exporting proofs to an encoding of coherent logic in Lambda-pi modulo.*

2. *Extend the implementation of Larus to allow exporting proofs to other proofs assistants than Coq, either using the Logipedia technology or by direct translation to preserve the readability of the generated proofs.*

3. *Design a tool to translate pieces of information gathered from an informal or formal proof to proof hints usable by Larus' prover, such as: intermediate statements or name of lemma to be used.*

4. *Experiment with our corpus based on Tarski or Euclid's geometry, which is in the scope of our system and a good source of aligned documents between different proof assistants, and also natural language proofs.*

Before the STSM, Larus has been extended to export proofs directly in the syntax of Mizar and

[1] This report is submitted by the grantee to the Action MC for approval and for claiming payment of the awarded grant. The Grant Awarding Coordinator coordinates the evaluation of this report on behalf of the Action MC and instructs the GH for payment of the Grant.

Isabelle/HOL. During the STSM we reviewed and discuss other potential export formats such as TSTP.

During the STSM we analysed the experiments concerning the reconstruction of proofs from informal proof sketches about Euclid's geometry in relation with the internship of Salwa Tabet Goncalves.

We discussed the extension of Larus to allow abductive reasoning and studied some examples.

Description of the STSM main achievements and planned follow-up activities

Description and assessment of whether the STSM achieved its planned goals and expected outcomes, including specific contribution to Action objective and deliverables, or publications resulting from the STSM. Agreed plans for future follow-up collaborations shall also be described in this section.

(max. 500 words)

We proposed a framework based on constraint solving that aims at turning a potential conjecture into a proper statement of a theorem. The conjecture can contain unknown hypothesis called abducts, and the goal may be not completely specified. Also, the proposed framework can help turn a proof sketch into a formal proof. The resulting, completed proof is both human-readable and machine-checkable. We focused on the field of synthetic geometry, and a paper is in preparation.

This work needs to be extended to evaluate more precisely the method using suitable benchmarks.