

Short-Term Scientific Mission Grant - APPLICATION FORM¹ -

Action number:

Applicant name:

Details of the STSM

Title: Reconstruction of of incomplete theorems and incomplete proofs with Larus

Start and end date: 15/07/2023 to 22/07/2023

Goals of the STSM

Purpose and summary of the STSM.

(max.200 word)

The purpose of this STSM is to work on abduction and hints of the automated theorem prover Larus. Abduction and hints are two means of reconstruction focusing on missing premisses (hypotheses) and incomplete proofs respectively. Some goals of this STSM are to limit the number of inconsistent abducts created and learning heuristics on how to give meaningful hints, but also work on proof export to TSTP format.

Working Plan

Description of the work to be carried out by the applicant.

(max.500 word)

This STSM would be used for improving support for reconstruction of incomplete theorems (given in TPTP form) and reconstruction of verifiable proofs (given in outline, by some proof steps). The visit would be used for making first steps in export of proofs from the theorem prover Larus to TSTP, which presents some challenges given that some easy axioms are omitted (inlined) by Larus, while the TSTP format requires each axiom used to be explicitly invoked.

This visit would also be used to improve our current support for abducts, which still produces many inconsistent abducts. This would be done by designing ways to recognize meaningless proofs, such as proof by contradiction and deriving “false” from it. Being in Belgrade would allow me to discuss these designing tasks directly with the developer of Larus, Mr. Predrag Janicic.

As a third line of work, we would improve our support for hints, which are an extension of the TPTP format that allows encoding of specific proof steps that must appear in the proof built by Larus. We haven't explored this feature as much as the others because it is difficult to measure to what extent hints

¹ This form is part of the application for a grant to visit a host organisation located in a different country than the country of affiliation. It is submitted to the COST Action MC via-e-COST. The Grant Awarding Coordinator coordinates the evaluation on behalf of the Action MC and informs the Grant Holder of the result of the evaluation for issuing the Grant Letter.

do or do not help the search for a proof. We have a set of 234 benchmarks, all from Euclid's Elements, which are difficult enough for hints to be useful, and we have an automated hint extractor to recover proof steps from their respective proofs in Coq (provided by GeoCoq). We will use these to search how to give the best hints possible, to judge if inlining of easy theorems jeopardizes the proving ability of Larus, and to eventually debug this functionality.

Expected outputs and contribution to the Action MoU objectives and deliverables.

Main expected results and their contribution to the progress towards the Action objectives (either research coordination and/or capacity building objectives) and deliverables.

(max.500 words)

Progress in the above lines of research will be important contribution to the prover Larus and the proving paradigm that it represents. The main expected results are to provide an export to TSTP, to improve support for abducts and for hints. Their contribution to the progress towards EuroProofNet, which aims at boosting the interoperability and usability of proof systems, is to be able to translate proofs from one system to another, by reconstructing it from scratch or from a set of hints. Also, one of the main advantages of Larus is its export to LaTeX in a human-readable form, therefore improving this system in general contributes to improving usability of proof systems.