

Report on the outcomes of a Short-Term Scientific Mission¹

Action number: CA20111

Grantee name: Amélie Ledein

Details of the STSM

Title: Rechecking KProver proof objects into Dedukti

Start and end date: 04/07/2022 to 17/07/2022

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)

Before I left for Romania, I had already targeted a first goal: to restrict myself to rechecking the concrete executions of KProver. So I wrote a first draft to better understand the information I was missing, and started to implement code to extend the translator from K to Dedukti (or more precisely, from Kore, a Matching Logic theory, to Dedukti).

This first work allowed me to target many questions to clarify with the K team, such as:

- Is my encoding of the Applicative Matching Logic correct? With what proof can I test it?*
- What symbols are in Kore's initial signature?*
- How to translate the Matching μ -Logic (Kore is based on it) into the Applicative Matching Logic?*
- How expressive is KProver and its trace?*
- Which axioms generated in the Kore file are really useful to the KProver?*

During this STSM, finally, I didn't only go to Bucharest. I spent a few days in Iasi which allowed me to exchange with Dorel Lucanu, Andrei Arusoae and Diana Gratie. Then I went to Bucharest, where I could exchange with Traian Serbanuta, Ana Pantilie, Denisa Diaconescu and Andrei Vacaru, researchers or developers of the K team.

I was also invited, once in Bucharest, to do a seminar on Dedukti, the main tool developed by the team in which I am doing my thesis (<https://los.cs.unibuc.ro/seminar-logic.html>). So I also met some members of the logic team of the University of Bucharest (<https://los.cs.unibuc.ro/index.html#people>), namely LAURENȚIU LEUȘTEAN, ANDREI SIPOȘ and HORAȚIU CHEVAL.

Finally, Jan Tusil came to Bucharest for a week together with me to discuss the common points and differences of our formalizations, respectively in Coq and Dedukti, of Matching Logic.

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.

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)

So I was able to consolidate the scientific interactions started in 2021 from a distance, and I even exchanged with many new people. Before my visit, I had mainly discussed with Dorel Lucanu, and exchanged some scientific messages with Ana Pantilie.

These exchanges allowed me to consolidate my understanding of K, Kore and Matching Logic. The various exchanges I had will allow me to submit the draft once updated, as well as to finish the code to recheck the proof objects of the KProver, when it performs concrete executions.

It is envisaged that Dorel Lucanu will apply for an STSM in April 2023 to come and work with me on verifying the symbolic executions of the KProver.

It is also envisaged to meet Xiaohong Chen in the USA, to discuss his thesis on Matching Logic. Funding has yet to be found, but several possibilities exist.

Daniel Horpacsı, who collaborates with Jan Tusil, has also proposed me to come to Budapest to discuss the similarities and differences between our formalizations, respectively in Coq and Dedukti, of the Matching Logic.

Indeed, Matching Logic has been formalised in Coq (mainly by Daniel Horpacsı and Jan Tusil), in Dedukti (by myself) and a formalisation in Lean is just starting at the beginning of July 2022 (LAURENȚIU LEUȘTEAN and HORAȚIU CHEVAL).

It is therefore envisaged to write a joint paper to compare the different formalisations of Matching Logic. This work could highlight the differences and similarities between Dedukti and Matching Logic, especially in terms of expressiveness.