

## Report on the outcomes of a Short-Term Scientific Mission<sup>1</sup>

Action number: CA20111

Grantee name: Matteo Manighetti

### **Details of the STSM**

Title: Leveraging a  $\lambda$ Prolog engine for type class resolution in Coq and Lambdapi

Start and end date: 15/10/2022 to 29/10/2022

### **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)*

The three parts discussed in the grant application have been developed to a prototype stage.

The Coq-Elpi plugin has been extended with the possibility of overriding the Typeclass resolution engine, so that custom, user-provided Elpi code can be run instead of the usual built-in procedure of Coq.

A flag has been introduced in Lambdapi to denote symbols that are to be treated as Typeclasses. The typechecker for Lambdapi has been extended with a call to an external piece of Elpi code in case holes remain that are typed with a typeclass term.

Finally, a generic typeclass resolver has been coded in Elpi, with a compilation method from Typeclass definitions that is uniform across Coq and Lambdapi.

### **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.

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<sup>1</sup>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.

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The prototypes show that it is feasible to extend Lambdapi with a simple typeclass mechanism implemented in a logic programming language, similar to the one we propose for Coq. This makes it possible to use libraries translated from Coq that contain typeclasses to their full potential.

The next step is to put this at work with the translation of Coq terms to Dedukti. Additional extensions are needed in Lambdapi so that it can handle typeclasses in Dedukti files, and the CoqInE translator needs to be modified in order to flag typeclass definitions and instances.