Short-Term Scientific Mission Grant
- APPLICATION FORM[1] -

Action number:

Applicant name:

Details of the STSM

Title: **A rethinking of a Prolog interpreter using Maude**

Start and end date: 21/07/2024 to 27/07/2024

Goals of the STSM

Purpose and summary of the STSM.

(max.200 word)

The goal of this mission would be to get more familiarized with Maude, a rewriting logic language that allows for the specification of several frameworks and logics and performs model checking in an efficient way.

Due to my previous work during the PhD and after that, I proposed extensions to Prolog operational semantics as well as declarative semantics, but I haven't introduced those extensions to a Prolog system. The main goal of this visit would be to have an expert, Santiago Escobar, in Maude help me define the Prolog interpreter and make the extensions I previously proposed in order to check the consequences to Prolog program execution.

Working Plan

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

A first step would be to have a discussion on Maude and how to define a Prolog interpreter, which there have been papers on, but have an expert explain the details and how Maude uses its features to optimize performance.

Then, we could take a Prolog interpreter that has already been defined or define one of our own if that did not take too much of our time and analyse what kinds of properties could be verified and how we could verify them, as well as how small changes to the definition affect the verification of those properties.

A third step, which would be our main goal, would be to extend the Prolog interpreter with a three-valued unification algorithm and use to change the operational semantics of Prolog from SLD-

[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.

resolution into TSLD-resolution, taking advantage of the algorithm to have type information and perform type checking on queries.

This extension has been described in previous papers by me and fellow researchers but the full definition of a Prolog interpreter using these extenstions and further ones has not been made yet. Having this definition in Maude would not only be a way to have an easy-to-change interpreter with those extensions for testing and changing it further, but also allow us to have intrinsically model checking to verify properties on the interpreter.

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)

We expect that:

- I get a deeper knowledge on how to use Maude and its main advantages in relation to other program verification tools.

- A group that uses Maude could be formed in my faculty due to several people having demonstrated interest and me having a deeper knowledge, which could help fellow local researchers become more aware of Maude and how they can use it.

- A Prolog interpreter that is ready for extensions to be introduced and tested, and properties verified, which could include a paper on this subject.

- A future visit from Santiago to Porto so that he could share his expertise with further researchers, thus fomenting the interest in the area of model checking using Maude in Porto.

- A larger community on Maude and a coordinated research in Porto and Valencia on this subject is not only possible but very likely.

- Papers on this subject and on the use of Maude for further verification of formalisms is an expected long-term outcome of this visit.