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

Action number: COST Action CA20111 EuroProofNet

Grantee name: Riccardo Treglia

Details of the STSM

Title: Liquid Monadic Intersection Types

Start and end date: 21/05/2023 to 31/05/2023

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.

The aim of this STSM has been to obtain a type system combining refinement types and the expressiveness of intersection type discipline, for a generic monadic calculus (i.e., a lambda calculus where the monad functor is a parameter) following the monadic approach already investigated by myself.

The first step was to design a dependently typed version of the computational core, a computational lambda calculus deeply connected to the original Moggi's one, and already investigated in my Ph.D. dissertation.

The objective, then, was to adapt a type system already presented by Mário Florido, Sandra Alves, and Mário Pereira, to this dependently typed version of the computational core.

In conclusion, we worked on such a type system so that any derivation in this undecidable system has a counterpart in a fixed, decidable one.

The opportunity of the visit was taken to give an introductory talk on computational core and my studies to the scientific community of the department of computer science in Porto.

Funded by
the European Union

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.

This STSM partially achieved its planned goals because we got a calculus and a type system that we had planned, proving such an important property as subject reduction. But in doing so, we realized that it was not trivial to use the monad functor in a parametric way in the case of a dependent version of Moggi's calculus. This gave us the opportunity, however, to gain new insights into how to obtain this type of extension. In fact, to derive a monadic liquid version we did not actually considered the functor of the monad as a parameter, but, in fact, we took into account its decomposed adjunction, like that of call-by-push-value by Levy, since it is a more flexible perspective than a monadic one.

As a follow-up to this STSM we will proceed by continuing the collaboration: proving other properties of the type system such as subject expansion, on the one hand, define a type inference algorithm for the decidable system, on the other. Such an algorithm has not to be designed from scratch but as an extension of the one that already appeared in previous works by my collaborators, so it is assumed it can be achieved in a smooth way.