A Functional Programming Approach to Teaching in Portuguese Foundational Computing Course
Part 1: Algorithmic toolkit

Proposta de Mestrado

Orientador: Simão Melo de Sousa
Co-orientador António Ravara

1 Context

This MSc Dissertation proposal aims at promoting the use of OCaml in the Portuguese speaking academic community, namely by providing support to teaching approaches and tools. In particular it aims at extending and consolidating the OCaml software user base and teaching materials in the Portuguese language for Computational Logic and Foundation of Computing courses in undergraduate Computer Science degrees.

In short, the proposal aims at the development in OCaml of an automated marking platform offering exercises in Portuguese of First-order Logic and Language/Automata Theory. The idea is to make available OCaml implementations of classical algorithms like conversion of formulae to normal forms, satisfiability checking, inter-conversion of automata and grammars, etc. We will re-use existing implementations and develop new ones when no solution is available. We will build on well-known and mature platforms like TryOCaml, France-IOI and JFLAP. The algorithms will be in the back-end of an automated grading platform to assist our courses.

This proposal is subject to a one year grant and will be funded by the Tezos Foundation.

2 Objectives

The student is expected to refactor and further develop the existing OCaml core implementation of the algorithms taught in the involved courses.

The first proposed task: it is expected that a common algorithmic framework will (re)designed such that, for instance, each included algorithm could be executed step by step in a forward or backward (i.e. undo) fashion, and such that each algorithm comes with the ability to show its internal state (eg, via monads, CPS etc..).

Then it is expected that the student will refactor and complete the existing code base for these two courses. Each included algorithm may come in two versions: a modular but direct implementation (easy to explain, easy to extend or

optimize as an exercise), or a version more adapted to the step-by-step execution style and amenable to graphic visualization.

3 Plano

- Sept. - Nov. : Technological review and state of the art.
- Dec - Jan. : Architectural design fo the proposed solution.
- Fev. - Mar. : Implementation.
- Apr. Mid-May: Proof-of-concept, Validation and Verification.
- May - Jun. : Dissertation writing.

4 Contact

Simão Melo de Sousa (desousa@di.ubi.pt)