

DEPARTAMENTO DE INFORMÁTICA

Productive Parallel Programming

Software Principles and Methods / VALSE Team



Pedro Monteiro

(Advisor: Miguel Pessoa Monteiro)

Software Consultant for *Infosistema* and a Software Engineering PhD Student.

Research focus on parallel SW Eng and patterns, with a recent step towards usability evaluation and BPMN. Worthy mentions include an Internship at UTAustin with Keshav Pingali and two times Shepherd at PLoP conference series.

Objectives

This PhD research aims to develop methods to help **lower the complexity parallel programming** and enable non-expert programmer to fully benefit from a new generation of parallelism-driven programming platforms.

We propose a conceptual framework for an **Hyper Algorithmic Recipe for Parallelism Intensive Endeavors** (HARPPIE), that explores code generation as the means to increase productivity in parallel programming. HARPPIE stands on four cornerstones:

Ease: Make parallel programming accessible;

Implementation Speed : On-demand prototyping

Obliviousness: Reduce information overload

Guidance : Guide design with fast feedback

Methodology

HARPPIE consists on a high level **graphical model of parallelism** where algorithms are designed using a language-independent **BPMN-like visual language**. This language acts both as documentation and as the means to increase the directness properties of the algorithm design as regards the mental conceptual model of the solution.

In parallel programming, not achieving the desired performance often forces a full redesign of the solution. The visual language in turn can be used to **generate parallel prototypes** for a set of **target programming models**, enabling the programmer to delay the decision of implementation medium until a base parallel version is obtained and benchmarked against other prototypes.

Expected Results

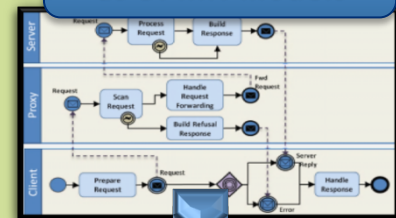
The main goal is to achieve an **increase in productivity with minimum impact on performance and correctness** of the end result, while at the same time **reducing the knowledge and choice overload** required for parallel programming to be widely adopted.

Our main deliverable is a prototype framework for HARPPIE which will be used to study our approach on parallel programming productivity. Validating our claims in HARPPIE requires extensive **user testing**, to evaluate the real impact of this prototype framework in programmer productivity, as well as **performance benchmarking** of the generated code prototypes against well-known code sources, such as the NAS parallel benchmarks..

Funding:

HARPPIE Conceptual framework

Design algorithms
as BPMN models



Code Generation

Prototype
Parallel
Code

Prototype
Parallel
Code

Benchmarking



Reduced knowledge
overload

Conscious informed
decision on what is
the optimal base code
option for the target
platform