IMPACT

Innovative Models for Prolog with Advanced Control and Tabling

Yap Prolog

YapOr
Or-Parallelism

YapTab
Tabling

BEAM
Extended Andorra Model

OPTYap
Or-Parallel Tabling

IMPACT

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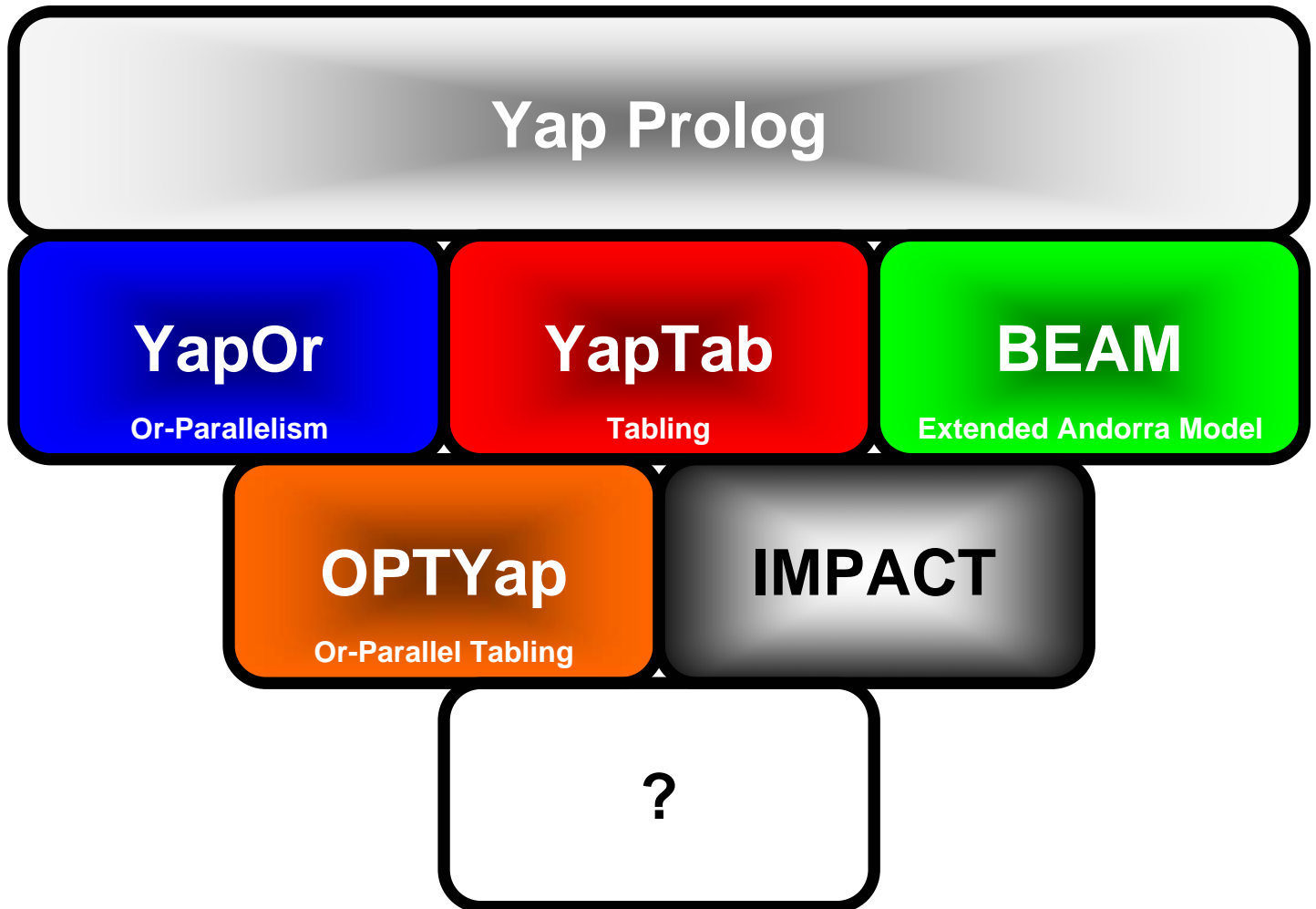
Our Research Group

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Our Goal

With the IMPACT project we want to combine the power of tabling with that of the Extended Andorra Model (EAM) in order to produce an execution model with advanced control strategies that guarantees termination, avoids looping, reduces the search space, and is less sensitive to goal ordering. In this project we focus on combining tabling with the EAM. Our ultimate goal is to develop a system that supports simultaneously and efficiently parallelism, tabling, and the EAM model.

Our Motivation

We have noticed that both EAM and tabling have common characteristics that seem to fit naturally.
- First, tabling contributes to one of the main premises of the EAM, reducing search space through the reuse of goals.
- Second, both paradigms are less sensible to goal ordering.
- Third, tabling avoids looping thus guaranteeing termination for programs with recursive computations.

Is thus our belief that BEAM with tabling opens up a design space for novel mechanisms to improve both control and performance of existing applications and to achieve a more declarative formulation of search and database applications.

Our Approach

To address the integration between tabling and the EAM we have identified the following tasks for the IMPACT project.
- Build an external module in C implementing tabling primitives that provide direct control over the search strategy. This module will allow tabling to be easily incorporated into other Prolog systems.
- Use the external module with BEAM to study how tabling interacts with the EAM. This involves running and validating the system with a set of benchmark applications.
- Design a new model to extend the BEAM system to support tabling running within the EAM environment. There are several major problems that need to be tackled.
  - Integrate the basic tabling operations with the BEAM execution model. This includes studying and defining how to start the execution of tabled subgoals, when new answers should be allowed to be exported, and how completion should be done. Note that whereas these operations are already complex for Prolog, they are even more intricate within the EAM.
  - Study the implications of tabling evaluation on the BEAM rewrite rules. Some of these rules, such as reduction, splitting, promotion, propagation, and-compression, deterministic-reduce-and-promote, success and failure propagation, will need to be modified to support tabling.
  - Study how pruning should be implemented on BEAM with tabling. BEAM allows both implicit and explicit pruning, but aggressive pruning may interfere with tabling and result in incomplete tables.
- Implement the combined system. The proposed work will be implemented on top of the existing systems and will profit from the expertise of our research group in the area.