PANDA

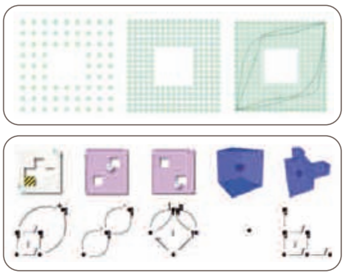
Parallelism And Distribution Analysis

ON GOING PROJECT

The validation of concurrent and distributed programs is difficult because the number of accessible states is too large to be enumerated, and even the number of control points, on which abstract collecting semantics are based, explodes. This is due to the great number of distinct scheduling of actions in legal executions.
The objective of this project is to develop theories and tools allowing for tackling this combinatorial explosion, in order to validate concurrent and distributed programs in an efficient manner.
We will consider various paradigms of computation and interaction, encompassing most of the classical ones, as well as more recent ones such as the ones found in Singularity for instance, which will provide a good "test case" for the formal semantics and methods the project is aiming at developing.

TECHNOLOGICAL OR SCIENTIFIC INNOVATIONS

The main objectives of the project are as follows:



- Give the theoretical tools for comparing the models for concurrent programs at hand, and in particular, the new ones such as the geometric models for concurrency.
- Compare several rising models to more classical ones:
  - Geometric models vs Transition Systems, Mazurkiewicz traces and Event structures;
  - Models based on higher order categories vs Rewriting systems, Event structures, and Mazurkiewicz traces.
- Bring together models for concurrency completing each other so we can take into account various aspects of parallelism. In particular, we think the interaction between spatial/separation logics and geometric models will raise breakthrough in understanding concurrent tasks behaviour.
- Implement a common platform for the static analysis of concurrent programs, based on the existing ALCOOL analyzer (developed by CEA LIST). In particular we wish to prove the adequacy of our approach on a representative piece of code (provided by Airbus).
- Develop a comprehensive framework for probabilistic concurrent systems that would apply to several models of concurrency; understand how usual concepts and tools from probability theory such as limit theorems apply to those models. A challenging part is to deal with asynchrony.

STATUS - MAIN PROJECT OUTCOMES

- Study of the category of future-paths components, providing a geometric interpretation for concurrent processes.
- Study of a notion of distance between probabilistic systems and continuous properties in the metric.
- A general construction to associate an event structure to a rewriting system.
- Development of model-cheching techniques to verify properties of probabilistic systems.
- Release of the "heaphop" tool, a proof-checker for concurrent heap-manipulating programs using Separation Logic.

CONTACT

Catuscia PALAMIDESSI
INRIA
+33 (0)1 69 33 41 17
catuscia@lix.polytechnique.fr

PARTNERS

Large companies:
AIRBUS FRANCE

Research institutes, universities:
CEA, UNIVERSITE PARIS NORD, UNIVERSITY OF PROVENCE, INRIA

PROJECT DATA

Coordinator:
INRIA

Call:
ANR

Start date:
October 2009

Duration:
36 months

Global budget (M€):
2.1

Funding (M€):
0.6

Related Sytematic project(s):
CPP