Remembering
Radhia Cousot (1947 - 2014)
1947 – 2014
Sakiet Sidi Youssef to Grenoble

Survivor of the bombardment of Sakiet Sidi Youssef and of the massacre of her school on Feb 8, 1958

Lycée français in Alger

1st ranked at Polytechnic School of Alger in Math! Only woman!!

Specialisation in mathematical optimisation and integer linear programming
Grenoble - Nancy - Paris

- 1972-1975 UNESCO Fellowship
- 1975–1979: Associate research scientist at IMAG, Grenoble
- 1980–1983: CNRS and Henri Poincaré University, Nancy
- 1984–1988: University of Paris-Sud at Orsay

http://en.m.wikipedia.org/wiki/Radhia_Cousot
Abstract Interpretation

Abstract Interpretation

It is our feeling that most program analysis techniques may be understood as abstract interpretations of programs.

There is a fundamental unity between all these apparently unrelated program analysis techniques: a new interpretation is given to the program text which allows to built an often implicit system of equations. The problem is either to verify that a solution provided by the user is correct, or to discover or approximate such a solution.
Abstract Interpretation

Semantics

The quest for a unique general-purpose semantics for programming languages has failed. A better approach is to establish correspondences between various semantics at different levels of abstraction.
the success stories in model checking are most often relative to bugs which have been found after exploration of part of the state space. When considering infinite systems, and except for very particular cases, incompleteness is to be taken into account.

......abandon the consideration of finite abstract domains and use widening/narrowing techniques
Abstract Interpretation

Transformation

...a constructive language-independent program transformation design methodology where the syntactic transformation is constructed systematically by approximation of a semantic transformation which is easily shown to be correct and efficient.
Abstract Interpretation

Watermarking

The key idea is that the stegosignature extraction is neither static (it is based on the semantics of the program not on its syntax), nor dynamic (program execution does not reveal the stegosignature) but abstract (the stegosignature is revealed by abstract interpretation of a (may be non-standard) state or trace-based collecting semantics of the program).
Our main goal was to have a non-intrusive, precise and scalable static analysis for array contents.

The analysis automatically and semantically divides arrays into consecutive non-overlapping possibly empty segments. Segments are delimited by sets of bound expressions and abstracted uniformly.
Abstract Interpretation

Termination

We have shown that the abstract interpretation principle directly applies to both safety (generalizing invariance) and termination.
A calculus of abstract interpretations

..... a Galois connection calculus for language independent specification of abstract interpretations used in programming language semantics, formal verification, and static analysis.
The problem:
building a proof system
from a semantics and conversely
building a semantics from a proof system

Proof methods for invariance and
inevitability for sequential, non-
deterministic and concurrent programs
The problem: building a proof system from a semantics and conversely building a semantics from a proof system

Proof methods for invariance and inevitability for sequential, non-deterministic and concurrent programs

We present semantic analysis techniques for concurrent programs which are designed as networks of nondeterministic sequential processes, communicating with each other explicitly, by the sole means of synchronous, unbuffered message passing. The techniques are introduced using a version of Hoare[78]'s programming language CSP [Communicating Sequential Processes].

Semantic Analysis of Communicating Sequential Processes. ICALP 1980
Semantics, Proof and Abstract Interpretation

A taste of semantics and how semantics are correlated!

Inductive Definitions, Semantics and Abstract Interpretation. POPL 1992
Semantics, Proof and Abstract Interpretation

“all semantics are well-behaved in the sense that they abstract the intuitive small-step trace semantics
[...] bi-inductive definitions should satisfy the need for formal semantics describing both finite and
infinite behaviors, at various levels of abstraction, and in different styles, despite the possible absence
of monotony”
Paris
Xavier Rival

>Bonjour,
>
>Merchi beaucoup pour [...] 

De rien! C'est un plaisir de te connaitre! 
Le prochain compliment ce sera pour la these?

amities,
radhia
Paris
PhD Students

Caterina
Ferdinanda
Francesco
Damien
Elodie
Pietro
Stanislav
Charles
Arnaud
SAS, POPL 1997 & 2013

Radhia Cousot best young researcher paper award @ SAS
“You write a paper because you have something new and significative to say, not because there is a deadline!”

–Radhia
Thanks