Effective Slicing: A Generalization of Full and Relevant Slicing

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Dynamic slice - a slice that is correct for one input
Execution slice - all statements executed for one input
Full slice - the result of a dynamic slicing algorithm that takes into account data and control dependencies
Relevant slice - the result of a dynamic slicing algorithm that takes into account data, control, and potential dependencies
Slicing criterion - execution instances and variables of interest

The union of correct full slices may be incorrect

The union of correct relevant slices is correct

The union of correct relevant slices is more precise than the intersection of a static slice and all executed statements

Correct unions of dynamic slices are desirable

Debugging: multiple inputs cause failure
Program understanding: an option to a program may have multiple values, but the programmer is interested in the behavior of the program when the option assumes any value

Future Work
How many steps to reach fixpoint?
How big are unions of relevant slices?
How good an approximation can effective slicing give?
How many, and what sort, of dynamic semantic facts can be extracted?
What other interesting generalizations of dynamic slicing exist?

Dynamic slicing algorithm - a function of two arguments:
a program, P
an initial state, s
Examples: full(P, e), relevant(P, e)

Effective slicing algorithm - a relevant slicing algorithm abstracted over a set, II, of potential statements:
\text{effective}(P, s, II) = \text{full}(P, s)
\text{effective}(P, s, II) = \text{relevant}(P, s)

II is the union of execution slices

In forming correct unions of slices potential dependences must be taken into account only when the potential statement is executed in some other slice

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Fixed Point Computation

Foundation
Weiser (1981)
Kast and Leali (1988)
Agarwal and Nongen (1990)

Formalization

Unions of Slices
Beswick, Ciesi, Danicic, Faragó, Gyimóthy, Hall, Hamen, Hinn, Kinn, Lucía, Szabó (1985 - 2007)

Practical Dynamic Slicing