Goldsmiths Program Analysis and Transformation Group

February 26, 2005

1 Research Areas

Program Slicing Conventionally, Program Slicing simplifies a program, by deleting statements, while preserving a projection of its semantics. Currently, we are investigating the existence of *minimal* slicing algorithms. We have introduced *Amorphous Slicing* Unlike conventional slicing, in amorphous slicing *all* semantics preserving transformations are allowed. We have also developed a theoretical framework of program projection upon which amorphous slicing is based. We are investigating problems with slicing programs with side effects. We have implemented a number of novel slicing algorithms.

Conditioned Slicing using Theorem Provers Program conditioning involves attempting to simplify a program assuming that the states it reaches at various points in its execution satisfy certain properties. These properties are specified by adding assertions at arbitrary points in the program. Program conditioning relies upon both symbolic execution and reasoning about symbolic predicates and therefore requires some form of automated theorem proving. We have developed systems that perform program conditioning with the aid of theorem provers These are the first fully automated implementations of program conditioning. We are also developing a semantic theory of program conditioning.

Evolutionary Mutation Testing Mutation Testing involves running slightly corrupted versions (mutants) of your target program through your test suite to see if any test cases flag the variations as defects. This enables us to measure abilty of the test suite to detect bugs. We are developing methods using genetic algorithms where the mutant programs and the test suite co-evolve to form a *stronger* test suite.

Theory of Program Schemas Program schemas define a class of programs, all of which have identical statement structure, but whose expressions may differ. Program Schemas have a well developed theory. We have introduced *linear schemas* and recently proved that given any two structured schemas which are conservative, linear and free, it is decidable whether they are equivalent. Problems that are expressed in terms of a Control Flow Graph can naturally expressed in terms of Linear Schemas whose theory can be used to verify the decidability of solutions to these problems. We are currently working on other results applying the theory of linear schemas to program slicing.

2 Projects

- TETRA (EPSRC GR/R98938/01).
- Guided Slicing and Targeted Transformation (EPSRC GR/M58719)

3 Software

- CONSIT - An Automated Conditoned Program Slicer
- ConSuS - A Lightweight Program Conditioner
- Espresso - A Java Slicer Generator
- JAbstract - A Java ABstract Syntax Tree Generator
- Lava - A Mutation Testing System

4 People

Sebastian Danicic (Goldsmiths)
Dave Daoudi (Goldsmiths)
Lahcen Ouarbya (Goldsmiths)
Eamonn Martin (Goldsmiths)
Michael Laurence (Ex Goldsmiths - now Liverpool)
John Howroyd (Ex Goldsmiths - now Reading)
Mark Harman (Ex Goldsmiths - now Kings)
Rob Hierons(Ex Goldsmiths - now Brunel)
Chris Fox (Ex Goldsmiths - now Essex)
Konstantinos Adamopoulos (Kings)
Yoga Sivagurunathan
Bala Sivagurunathan

5 Publications

Published Journal Articles
Conference Articles

6 PhD Students

Michael Laurence (Completed 2004) *Equivalence of Liberal Free Linear Program Schemas is Decidable in Polynmial Time*
Prinicipal Supervisor: Sebastian Danicic Other supervisors: Mark Harman ,Rob Hierons, John Howroyd

Lahcen Ouarbya (submitted Nov 2004) A new semantics for program slicing
Prinicipal Supervisor: Sebastian Danicic Other supervisors: Chris Fox , Mark Harman , John Howroyd

Dave Daoudi (submitting 2005) Light Weight Program Conditioning
Prinicipal Supervisor: Sebastian Danicic Other supervisors: Chris Fox ,Mark Harman ,John Howroyd

Eamonn Martin (Just Started) Java Program Transformation Tools
Prinicipal Supervisor: Sebastian Danicic

Yoga Sivagurunathan (London Met)(Completed 2004) *Modelling Dynamic Memory Allocation and Deallocation using Amorphous Slicing*
Prinicipal Supervisor: Mark Harman Other supervisors: Sebastian Danicic

Konstantinos Adamopoulos (Kings) Mutation Testing
Prinicipal Supervisor: Mark Harman Other supervisors: Rob Hierons,Sebastian Danicic

Bala Sivagurunathan (London Met) Slice-Based Measurement of Cohesion and Coupling
Prinicipal Supervisor: Mark Harman Other supervisors: Sebastian Danicic

7 Conferences and Events

- PLID 2004 (Verona)
- SCAM 2005 (Budapest)
- Dagstuhl Seminar 05451 2005

8 Joining the Group

If you would like to join the group please contact Sebastian Danicic .

9 Further Information

If you require further information please contact Sebastian Danicic .

10 Related Links

- VASTT
- GAMUT