

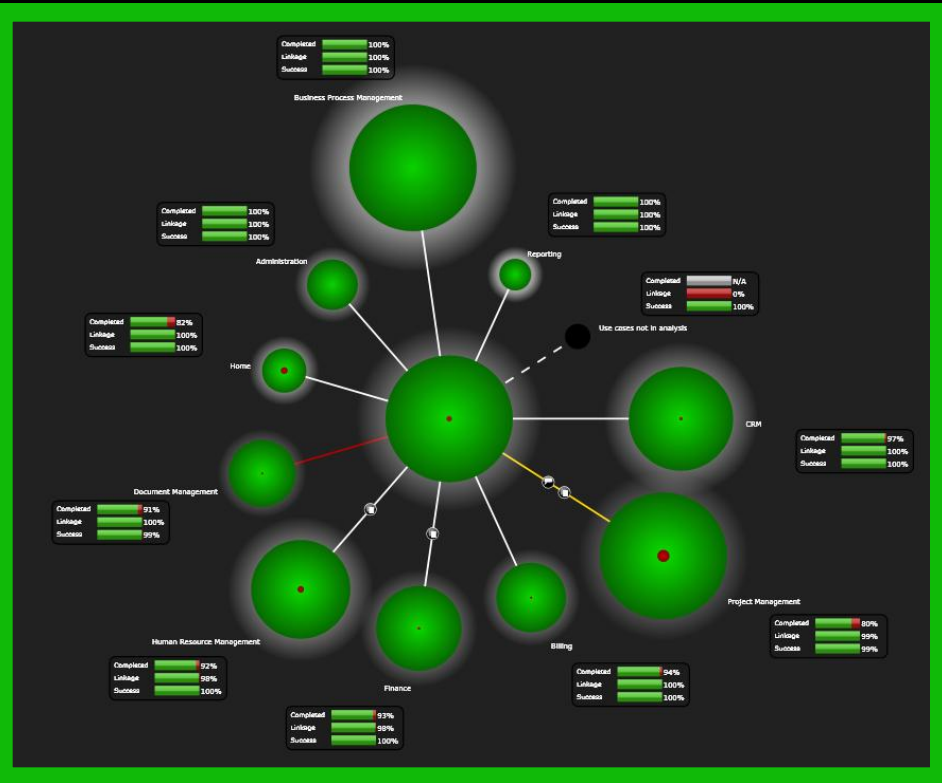


IBM Research

Automated Substring Hole Analysis

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The System Test Coverage Problem



Genesis project overview

Coverage report: /tmp/test1.lisp

Kind	Covered	All	%
expression	17	29	58.6
branch	6	10	60.0

Key

Not instrumented

Conditionalized out

Executed

Not executed

Both branches taken

One branch taken

Neither branch taken

```

1 (declaim (optimize sb-cover:store-cover
2
3 (defun test (n)
4   (when (zerop n)
5     (if (eql n 0)
6         (print 'zero)
7         (if (eql n 0.0)
8             (print 'single-fp-zero)
9             (print 'double-fp-zero))))))
10  (when (minusp n)
11    (print 'negative))
12  (when (plusp n)
13    (tagbody
14      (print 'positive)
15      (go end)
16      (print 'dummy)
17      end)))
18
19 (test 0)
20 (test 1)
21

```

Introducing the concept of a hole - a substring that exists in many functions/file names for which there is poor coverage

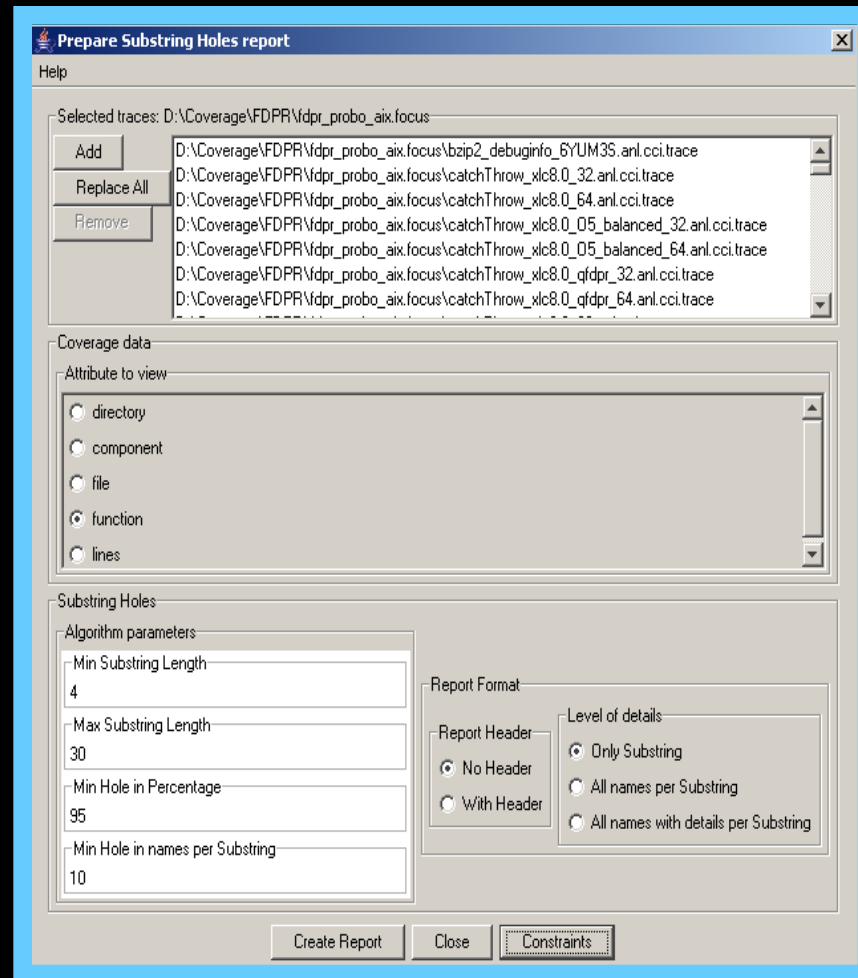
Substring Holes Report - [D:\Coverage\FDPR\fdpr_probo_aix.focus\SubstringHolesSubsDetailsAll2009-5-7-2-27-53.txt]

Font: Name: Courier New, Size: 11, Bold: , Italic:

holePercentage: 95.00 sort: SQCOV_TOTAL_LENGTH similarityPercentage: 50.00 uncoverCoefficient: 2.00 power: 0.5
 minSubsLength: 4 maxSubsLength: 30 minTotal: 10

1	Total	Uncovered	Sub-string	Components
2				
3	13575	13556	AbsAsm::	(other)
4				
5	Uncovered			
6	-----			
7	Assembler/AbsAsm	other	AbsAsm.h	AbsAsm::AbsoluteTag::getClassTypeName()-const
8	Assembler/AbsAsm	other	AbsAsm.cpp	AbsAsm::AbsoluteTag::getInstance()
9	Assembler/AbsAsm	other	AbsAsm.h	AbsAsm::AbsoluteTag::getSize()-const
10	Assembler/AbsAsm	other	AbsAsm.h	AbsAsm::AbsoluteTag::setOverrideRootBeginOffset(int)
11	Assembler/AbsAsm	other	AbsAsm.h	AbsAsm::AbsoluteTag::setOverrideSize(int)
12	NotFound	other	NotFound	AbsAsm::AbsoluteTag::~~AbsoluteTag()
13	Assembler/AbsAsm	other	AbsAsm.cpp	AbsAsm::AbstractAction::addToTrash(Object*)
14	Assembler/AbsAsm	other	AbsAsm.cpp	AbsAsm::AbstractAction::apply()
15	Assembler/AbsAsm	other	AbsAsm.h	AbsAsm::AbstractAction::getClassTypeName()-const
16	Assembler/AbsAsm	other	AbsAsm.h	AbsAsm::AbstractAction::isApplied()-const
17	NotFound	other	NotFound	AbsAsm::AbstractAction::~isApplied()-const
18	Assembler/AbsAsm	other	AbsAsm.cpp	AbsAsm::AbstractAction::removeFromTrash(Object*)
19	Assembler/AbsAsm	other	AbsAsm.cpp	AbsAsm::AbstractAction::unapply()
20	NotFound	other	NotFound	AbsAsm::AbstractAction::~~AbstractAction()
21	NotFound	other	NotFound	AbsAsm::AbstractAction::~default_AbstractAction()
22	Assembler/AbsAsm	other	AbsAsm.cpp	AbsAsm::AbstractFactory::AbstractFactory()
23	NotFound	other	NotFound	AbsAsm::AbstractFactory::addSpecialDecomposers()
24	Assembler/AbsAsm	other	AbsAsm.cpp	AbsAsm::AbstractFactory::createView_d(const-AbsAsm::Lexema&)-const
25	Assembler/AbsAsm	other	AbsAsm.cpp	AbsAsm::AbstractFactory::create_d(RawData)-const
26	Assembler/AbsAsm	other	AbsAsm.cpp	AbsAsm::AbstractFactory::getDecomposer(AbsAsm::Serial*)-const
27	Assembler/AbsAsm	other	AbsAsm.cpp	AbsAsm::AbstractFactory::registerBuilder(AbsAsm::InsBuilder*)
28	Assembler/AbsAsm	other	AbsAsm.cpp	AbsAsm::AbstractFactory::registerDecomposer(AbsAsm::Serial*,-AbsAsm::InsDe
29	Assembler/AbsAsm	other	AbsAsm.cpp	AbsAsm::AbstractFactory::registerSpecialDecomposer(AbsAsm::SpecialDecompos
30	Assembler/AbsAsm	other	AbsAsm.cpp	AbsAsm::AbstractFactory::registerViewBuilder(AbsAsm::ViewBuilder*)
31	Assembler/AbsAsm	other	AbsAsm.cpp	AbsAsm::AbstractFactory::sortBuilders()-const

User Interface of FoCuS when Looking for Holes



Output of FoCuS with Holes Defined

Substring Holes Report - [D:\Coverage\FDPR\fdpr_probo_aix.focus\SubstringHolesSubs2009-5-7-2-6-16.txt]

Font

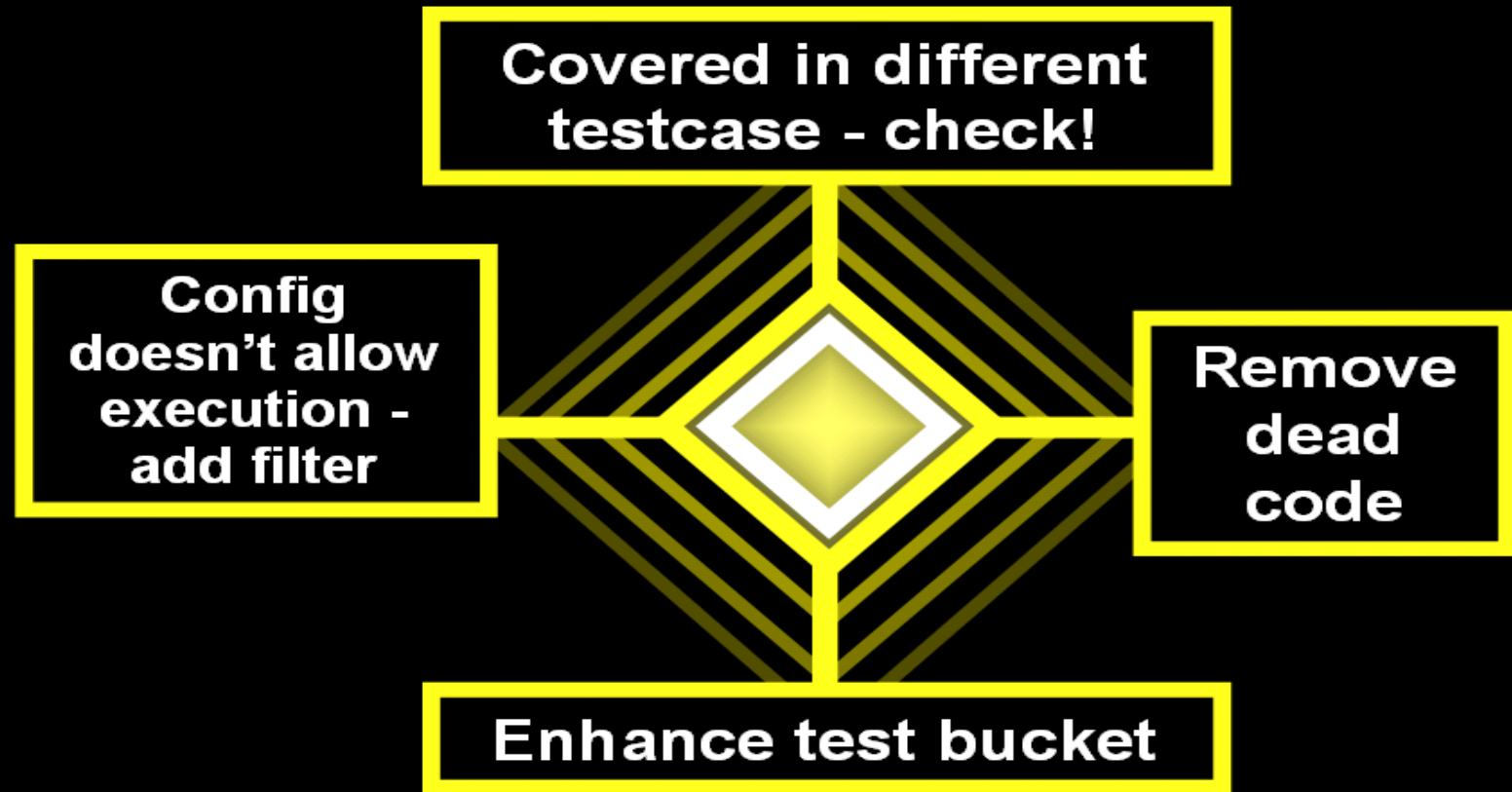
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```

holePercentage: 95.00  sort:SQCOV_TOTAL_LENGTH  similarityPercentage: 50.00  uncoverCoefficient: 2.00  power: 0.50
minSubsLength: 4  maxSubsLength: 30  minTotal: 10
1  Total      Uncovered  Sub-string      Components
2
3  13575      13556     AbsAsm::        ( other )
4  4246       4194      HLR::           ( other )
5  2559       2542      default         ( other )
6  599        598       Same            ( other )
7  590        590       PpcIs::create   ( other )
8  602        591       Ppc*clone       ( other )
9  566        563       Intra           ( other )
10 534         523       std::           ( other )
11 411         399       String-const    ( other )
12 389         385       AIXPpcConfiguration ( other )
13 315         315       Dwarf           ( other )
14 265         253       SimpleEdge      ( other )
15 187         182       base_           ( other )
16 176         174       Ppc*VD          ( other )
17 176         171       PpcIs::Instruction::has_ ( other )
18 145         144       External        ( other )
19 138         138       PpcIs::MDSForm_RA_ ( other )
20 133         133       has_XO_OF_     ( other )
21 133         131       dbg_print       ( other )
22 130         124       Symboled        ( other )
23 117         117       _v_            ( other )
24 110         110       FuncCFG         ( other )
25 106         105       Instruction::is ( other )
26 98          98        PpcIs::ZForm_  ( other )
27 97          97        get_XO-const   ( other )
28 86          86        Circulation     ( other )
29 86          84        Comments::     ( other )
30 82          82        NewCA::        ( other )
31 80          80        Cluster        ( other )
32 81          78        ::Vertex       ( other )
33 70          70        MaxFlowInfuser ( other )

```


Action Item for a Hole



Coverage Driven Testing Workflow

