

PROJET AVL

I. Introduction

II. Structure du projet

III. Code coverage &
Mutation testing

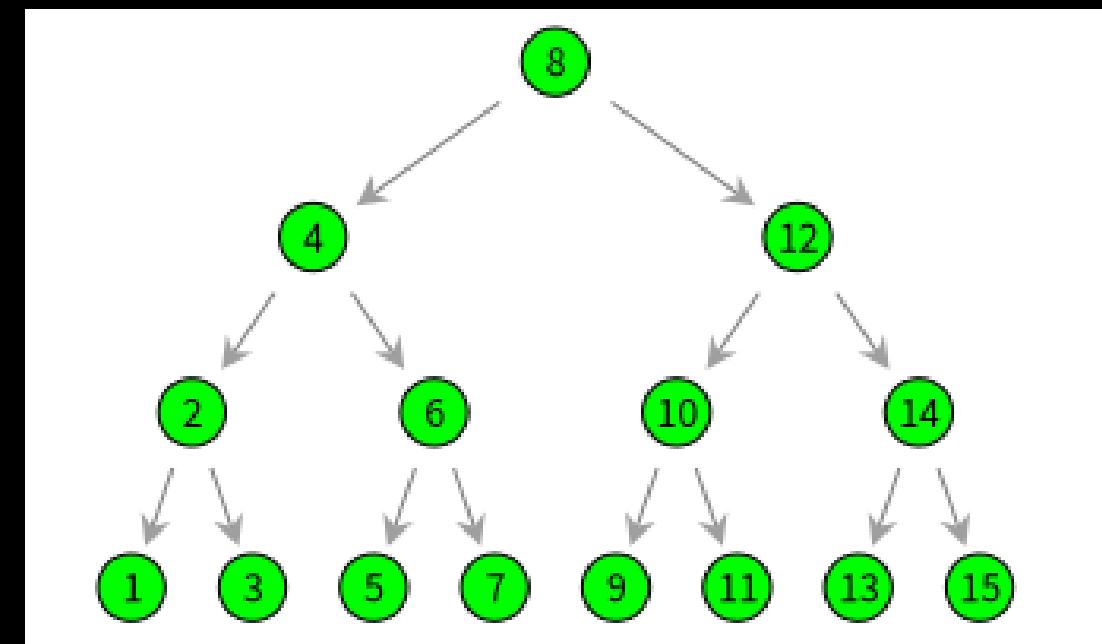
IV. Conclusion

Besbas Mélik
Leulmi Mohamed

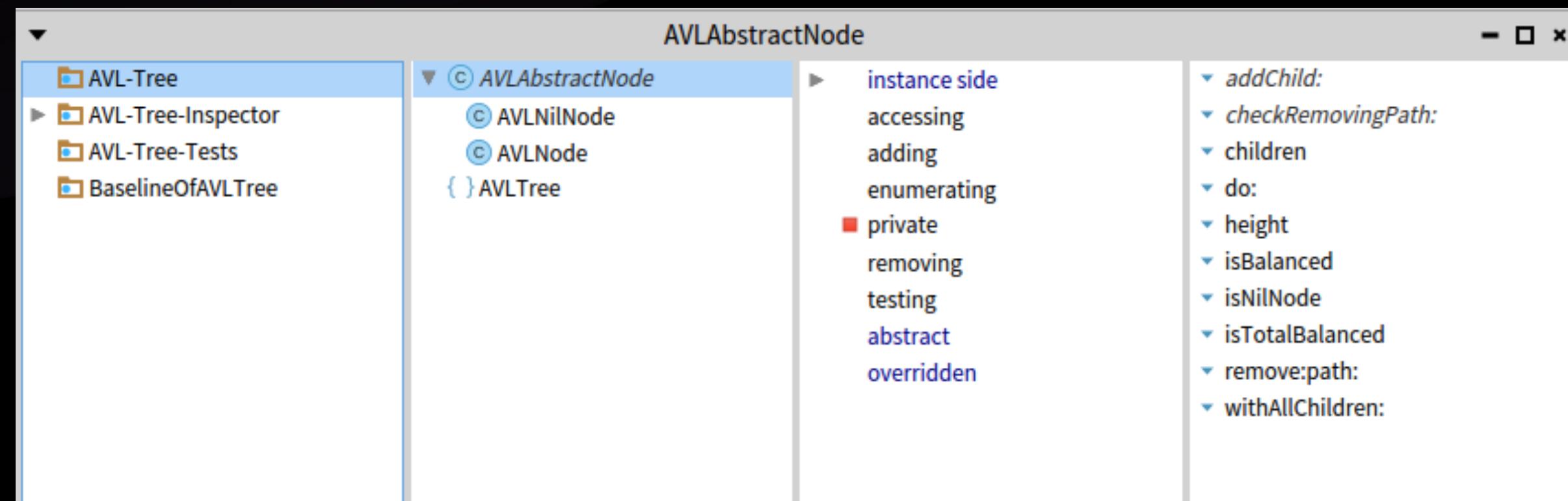
I. INTRODUCTION

AVL C'est quoi ?

- Arbre binaire de recherche auto-équilibré possédant une racine et de sorte que chaque nœud possède au maximum 2 éléments fils.
- Les hauteurs des deux sous-arbres d'un même nœud diffèrent au plus de un



II. STRUCTURE DU PROJET



- AVL-Tree : Le package principal pour l'implémentation de l'arbre AVL
- AVL-Tree-Inspector : contient des outils d'inspection spécifiques pour l'arbre AVL.
- AVL-Tree-Tests : contient les tests unitaires pour l'implémentation de l'arbre AVL.
- AVL-Tree : un package de configuration ou de gestion des dépendances.

II. STRUCTURE DU PROJET

Implémentation du code

Classe abstraite

```
Object subclass: #AVLAbstractNode  
instanceVariableNames: ''  
classVariableNames: ''  
package: 'AVL-Tree'
```

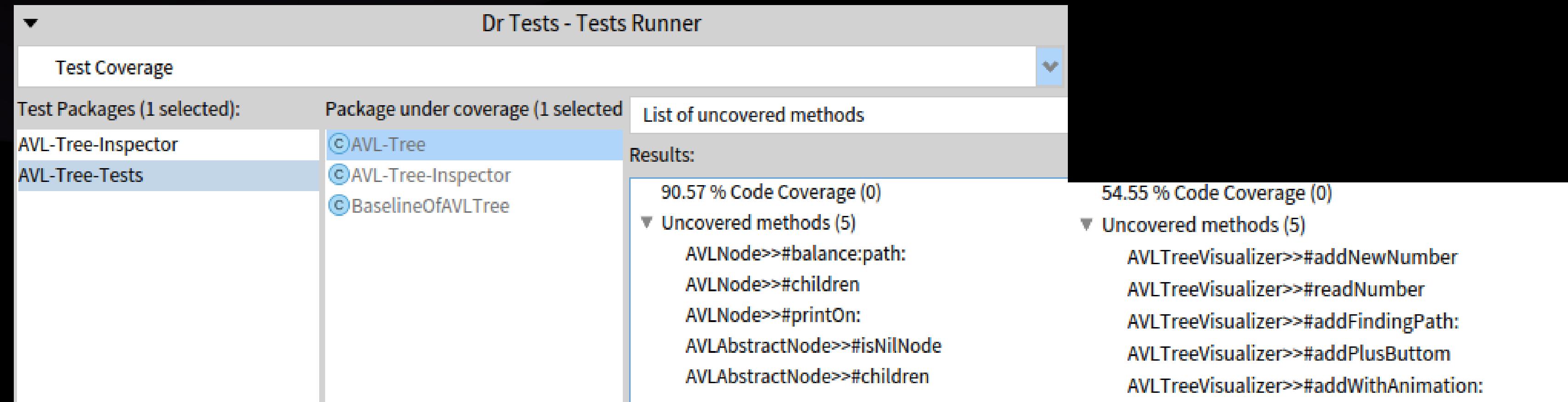
Classe représentant un noeud vide

```
AVLAbstractNode subclass: #AVLNilNode  
instanceVariableNames: ''  
classVariableNames: ''  
package: 'AVL-Tree'
```

Classe représentant un noeud non vide

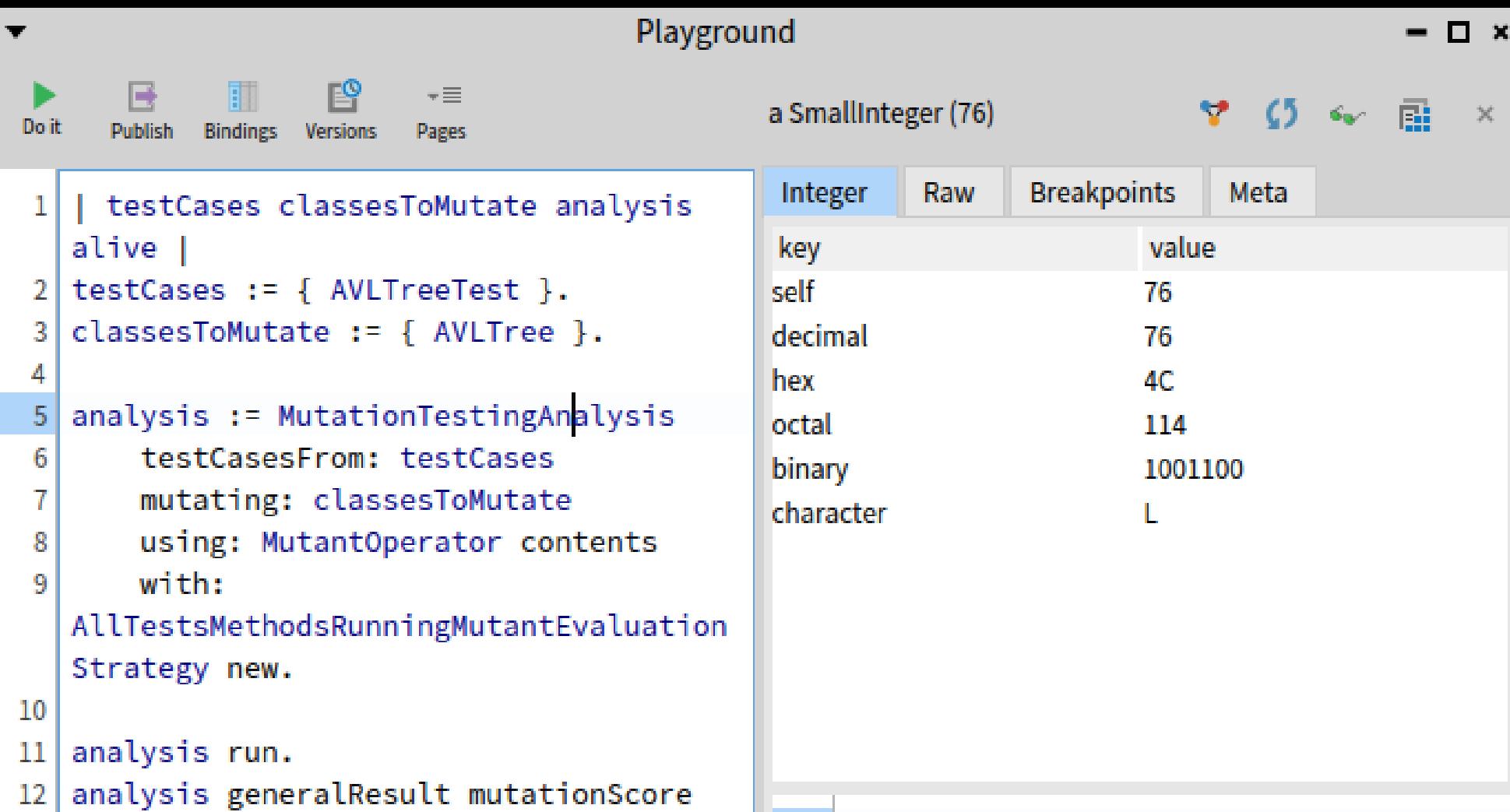
```
AVLAbstractNode subclass: #AVLNode  
instanceVariableNames: 'left contents right'  
classVariableNames: ''  
package: 'AVL-Tree'
```

III.A. CODE COVERAGE



- Plus de 90% de couverture de test pour la classe principale
- 5 Méthodes non couvertes
- Ne mesure pas la pertinence et la précision des Tests
- Pas un indicateur de performance des tests

III.B. MUTATION TESTING



The screenshot shows a 'Playground' window with a toolbar at the top featuring 'Do it', 'Publish', 'Bindings', 'Versions', and 'Pages' buttons. The main area has a title 'a SmallInteger (76)' above a table. The table has four tabs: 'Integer' (selected), 'Raw', 'Breakpoints', and 'Meta'. The 'Integer' tab displays the value 76 in various formats: self (76), decimal (76), hex (4C), octal (114), binary (1001100), and character (L). The code editor on the left contains the following code:

```
1 | testCases classesToMutate analysis
  alive |
2 testCases := { AVLTreeTest }.
3 classesToMutate := { AVLTree }.
4
5 analysis := MutationTestingAnalysis
  testCasesFrom: testCases
  mutating: classesToMutate
  using: MutantOperator contents
  with:
    AllTestsMethodsRunningMutantEvaluation
    Strategy new.
10
11 analysis run.
12 analysis generalResult mutationScore
```

- 76% de Couverture de Mutation
- 24% de Mutations non Déetectées

III.B. MUTATION TESTING

+ Variable	+ Value
self	17 mutants, 13 killed, 4 alive, 0 terminated. Mutation Score: 76%.
{ } particularResults	an OrderedCollection [17 items] (Remove ^ in AVLTree>>#add: Remove ^ in AVLTree>>#height Remove [...])
Σ elapsedTime	0:00:00:00.243

+ + Value
1 Remove ^ in AVLTree>>#add:
2 Remove ^ in AVLTree>>#includes:
3 Remove ^ in AVLTree>>#remove:ifAbsent:
4 Remove ^ in AVLTree>>#inspectorCanvas

- 4 mutants toujours en vie
- Amélioration du score de mutation possible

III.B. MUTATION TESTING

Suppression des mutants

Mutant 1 (add)

```
add: newObject  
  
    root := root addChild: newObject.  
    ^ newObject
```

Mutant 2 (includes)

```
includes: anObject  
  
anObject ifNil: [ ^ nil ].  
^ (self search: anObject) notNil
```

Mutant 3 (remove)

```
| toRemove path |  
path := OrderedCollection new.  
toRemove := root remove: oldObject path: path.  
toRemove ifNil: [ ^ anExceptionBlock value ].  
  
toRemove == root ifTrue: [  
    root := root successor: path.  
    root ifNil: [ root := AVLNilNode new ].  
root checkRemovingPath: path.  
  
^ toRemove contents
```

Mutant 4 (inspectorCanvas)

```
inspectorCanvas  
  
<inspectorPresentationOrder: 90 title: 'AVL'>  
^ AVLTreeVisualizer new  
    tree: self;  
    asPresenter
```

III.B. MUTATION TESTING

Modifications apportées

Variable	Value
self	13 mutants, 13 killed, 0 alive, 0 terminated. Mutation Score: 100%.

- Tout les mutants ont été éliminés
- Amélioration du Mutation score

IV. CONCLUSION

- Petit projet avec très peu de classe
- Pas de Design Pattern évident
- Méthodes assez courtes
- Coverage de test améliorable
- Très peu de documentation

ARTEFACT

Dr Tests - Tests Runner

Test Coverage

Test Packages (1 selected): Artefact-Core-Tests

Package under coverage (1 selected)

- AI-Algorithms-Graph
- AI-Algorithms-Graph-Components
- AI-Algorithms-Graph-Tests
- AST-Core
- AST-Core-Tests
- AST-Core-Traits
- Announcements-Core
- Announcements-Core-Tests
- Artefact-Core
- Artefact-Core-Tests
- Artefact-Examples
- Athens-Balloon
- Athens-Cairo

List of uncovered methods

Results:

- 60.00 % Code Coverage (0)
- Uncovered methods (2)
- Partially covered methods (0)

Playground

a Duration (0:00:18:58.769)

Do it Publish Bindings Versions Pages

```
1 testCases := {PDFBasicTest . PDFColorTest . PDFDataTypeTest
.PDFDemosTest . PDFFieldTest . PDFFontTest . PDFGeneratorTest
.PDFHorizontalLayoutTest . PDFParagraphTest . PDFStreamPrinterTest }|.
2 classesToMutate := 'Artefact-Core'asPackage definedClasses.
3
4 analysis := MutationTestingAnalysis
5   testCasesFrom: testCases
6   mutating: classesToMutate
7   using: MutantOperator contents
8   with: AllTestsMethodsRunningMutantEvaluationStrategy new.
9
10 analysis run.
11 testSelection := [analysis run.] timeToRun. "0:00:01:19.115"
```

Details Raw Breakpoints Meta

key	value
self	0:00:18:58.769
human readable	18 minutes 58 seconds 769 milliseconds
days	0
hours	0
minutes	18
seconds	58
nanoseconds	769000000

1 self

+L

Line: 1:26

Playground

Do it Publish Bindings Versions Pages

1 analysis generalResult mutationScore

a SmallInteger (31)

Integer Raw Breakpoints Meta

key	value
self	31
decimal	31
hex	1F
octal	37
binary	11111
character	

Playground

an OrderedCollection [826 i...]

Do it Publish Bindings Versions Pages

Items Raw Breakpoints Meta

: In : Value

- 1 Remove ^ in PDFJpegElement class>>#fromMorph:
- 2 Replace #+ with #- in PDFBezierCurveElement>>#producePageElementCodeWith:styleSheet:
- 3 Replace do block with [:each |] in PDFBezierCurveElement>>#producePageElementCodeWith:styleSheet:
- 4 Remove ^ in PDFPage>>#defaultFormat
- 5 Remove ^ in PDFPage>>#margins
- 6 Remove ^ in PDFPage class>>#elements:
- 7 Remove ^ in PDFPage class>>#element:
- 8 Remove ^ in PDFDataXRef>>#acceptVisitor:
- 9 Remove ^ in PDFOpacityLuminosity>>#blendMode
- 10 Remove ^ in PDFDataStream>>#acceptVisitor:
- 11 Remove ^ in PDFOpacityColorDodge>>#blendMode
- 12 Remove ^ in PDFDataAssociativeArray>>#acceptVisitor:
- 13 Remove ^ in PDFFbookFormat>>#defaultSize
- 14 Remove ^ in PDFCodeSegment>>#isSecure
- 15 Remove ^ in PDFCodeSegment>>#printWith:
- 16 Remove ^ in PDFCodeSegment class>>#isAbstract
- 17 Replace a == b with (a == b) not in PDFCodeSegment class>>#isAbstract

1 self

#	Results
1	Remove ^ in PDFDotted>>#generateCodeWith:
2	Remove ^ in PDFDotted>>#space
3	Remove ^ in PDFDotted>>#length
4	Remove ^ in PDFA9Format>>#defaultSize
5	Remove ^ in PDFDataSymbol>>#isPrintable
6	Remove ^ in PDFDataSymbol>>#acceptVisitor:
7	Remove ^ in PDFDataSymbol>>#symbol
8	Remove ^ in PDFDataSymbol class>>#symbol:
9	Remove ^ in PDFDataDateAndTime>>#isPrintable
10	Remove ^ in PDFDataDateAndTime>>#time
11	Remove ^ in PDFDataDateAndTime>>#acceptVisitor:
12	Remove ^ in PDFDataDateAndTime>>#date
13	Remove ^ in PDFDataDateAndTime>>#formatDate:time:
14	Replace #< with #> in PDFDataDateAndTime>>#formatDate:time:
15	Replace #< with #> in PDFDataDateAndTime>>#formatDate:time:
16	Replace #< with #> in PDFDataDateAndTime>>#formatDate:time:
17	Replace #ifTrue: receiver with false in PDFDataDateAndTime>>#formatDate:time:
18	Replace #ifTrue: receiver with false in PDFDataDateAndTime>>#formatDate:time:

28 Remove ^ in PDFOnesecureElementCodeSegment<>#isSecure

29 Remove ^ in PDFSymbolFont>>#charWidths

30 Remove ^ in PDFSymbolFont>>#family

31 Remove ^ in PDFSymbolFont>>#fontName

32 Remove ^ in ArtefactOverSizedContent>>#content

33 Remove ^ in PDFLayout>>#createOriginalPositionDictionary

34 Replace do block with foreach loop in PDFLayout>>#createOriginalPositionDictionary

```
hour := aTime hours.  
str := hour asString.  
hour < 12 ifTrue: [ str := '0' , str ].  
timeStr := str.
```

```
minutes := aTime minutes.  
str := minutes asString.  
minutes < 10 ifTrue: [ str := '0' , str ].  
timeStr := timeStr , str.
```

```
seconds := aTime seconds.  
str := seconds asString.  
seconds < 10 ifTrue: [ str := '0' , str ].  
timeStr := timeStr , str.
```

```
^ (aDate yyyyymmdd copyWithRegex: '-' matchesReplacedWith: ''  
, timeStr
```

```
hour := aTime hours.  
str := hour asString.  
hour < 12 ifTrue: [ str := '0' , str ].  
timeStr := str.
```

```
minutes := aTime minutes.  
str := minutes asString.  
true ifTrue: [ str := '0' , str ].  
timeStr := timeStr , str.
```

```
seconds := aTime seconds.  
str := seconds asString.  
seconds < 10 ifTrue: [ str := '0' , str ].  
timeStr := timeStr , str.
```

```
^ (aDate yyyyymmdd copyWithRegex: '-' matchesReplacedWith: ''  
, timeStr
```

DESIGN PATTERN

Factory

PDFA0Format>>defaultSize

The screenshot shows a Java code editor interface. On the left, there's a tree view of packages: Artefact-Core, Artefact-Core-Tests, Artefact-Examples, Artefact-Tutorial, and BaselineOfArtefact. The main pane displays the class hierarchy for PDFFormat, with PDFA0Format highlighted. To the right, a detailed view of the defaultSize method is shown, including its parameters, return type, and implementation. The bottom navigation bar includes tabs for Dependencies, PDFA0Format, Comment, defaultSize (which is selected), and Inst. side methc.

Artefact-Core
Artefact-Core-Tests
Artefact-Examples
Artefact-Tutorial
BaselineOfArtefact

artefact
Filter...

All Packages Scoped View | Flat | Hier. | Inst. side | Class side | Methods | Vars | Class refs. | Implementors | Senders

Dependencies PDFA0Format Comment defaultSize Inst. side methc

defaultSize

instance side ▲
accessing - defaults
overrides

defaultSize

PDFHelveticaFont
PDFSymbolFont
PDFTimesFont
PDFZapfdingbatsFont
PDFFormat
PDFA0Format
PDFA10Format
PDFA1Format
PDFA2Format
PDFA3Format
PDFA4Format
PDFA5Format
PDFA6Format
PDFA7Format
PDFA8Format
PDFA9Format

2384.03 point @ 3370.53 point

DoubleDispatch

PDFFElementCodeSegment>>printWith:

The screenshot shows a Java documentation search interface. On the left, there's a sidebar with project navigation. The main area displays the class hierarchy for `PDFFElementCodeSegment`. The `printWith:` method is selected, and its implementation is shown in the bottom pane. The search bar at the top contains the query `PDFFElementCodeSegment>>printWith:`.

Artefact-Core

Artefact-Core-Tests

Artefact-Examples

Artefact-Tutorial

BaselineOfArtefact

Artefact

ArtefactOverSizedContent

ArtefactUndefinedAttribute

ManifestArtefactCore

PDFAlignment

PDFAngleDirected

PDFByteCode

PDFFCodeSegment

PDFCompositeCodeSegment

PDFFElementCodeSegment

PDFUnsecureElementCodeSegment

PDFColor

PDFDataType

PDFdataArray

PDFDataAssociativeArray

PDFDataComment

PDFDataString

Filter...

All Packages Scoped View Flat Hier. Inst. side Class side Methods Vars Class refs. Implementors Senders

Dependencies PDFFElementCodeSegment Comment printWith: Inst. side methods

printWith: aPDFWriter
aPDFWriter printElementCodeSegment: self

instance side ▲ □
accessing
overrides

code
code:
fontId
fontId:
format
format:
opacityId
opacityId:
printWith:

PDFDataComment>>acceptVisitor:

The diagram shows a UML class hierarchy. At the top level, there is a class named 'Artefact-Core'. Below it, under the package 'Artefact-Core', is a class 'PDFDataComment'. This class has several subclasses listed below it: 'PDFCompositeCodeSegment', 'PDFElementCodeSegment', 'PDFUnsecureElementCodeSegment', 'PDFColor', 'PDFDataType', 'PDFdataArray', 'PDFDataAssociativeArray', and 'PDFDataComment' (which is highlighted with a blue selection bar). Further down the list are 'PDFDataCouple', 'PDFDataDateAndTime', 'PDFDataObject', 'PDFDataReference', 'PDFDataStartXref', 'PDFDataStream', and 'PDFDataStreamRefSize'. A 'Filter...' button is located at the bottom of this list.

Artefact-Core

PDFDataComment

PDFCompositeCodeSegment
PDFElementCodeSegment
PDFUnsecureElementCodeSegment
PDFColor
PDFDataType
PDFdataArray
PDFDataAssociativeArray
PDFDataComment
PDFDataCouple
PDFDataDateAndTime
PDFDataObject
PDFDataReference
PDFDataStartXref
PDFDataStream
PDFDataStreamRefSize

Filter...

instance side

accessing
printing
testing
visiting
overrides

acceptVisitor:
comment
comment:
isPrintable
printOn:

All Packages Scoped View Flat Hier. Inst. side Class side Methods Vars Class refs. Implementors Senders

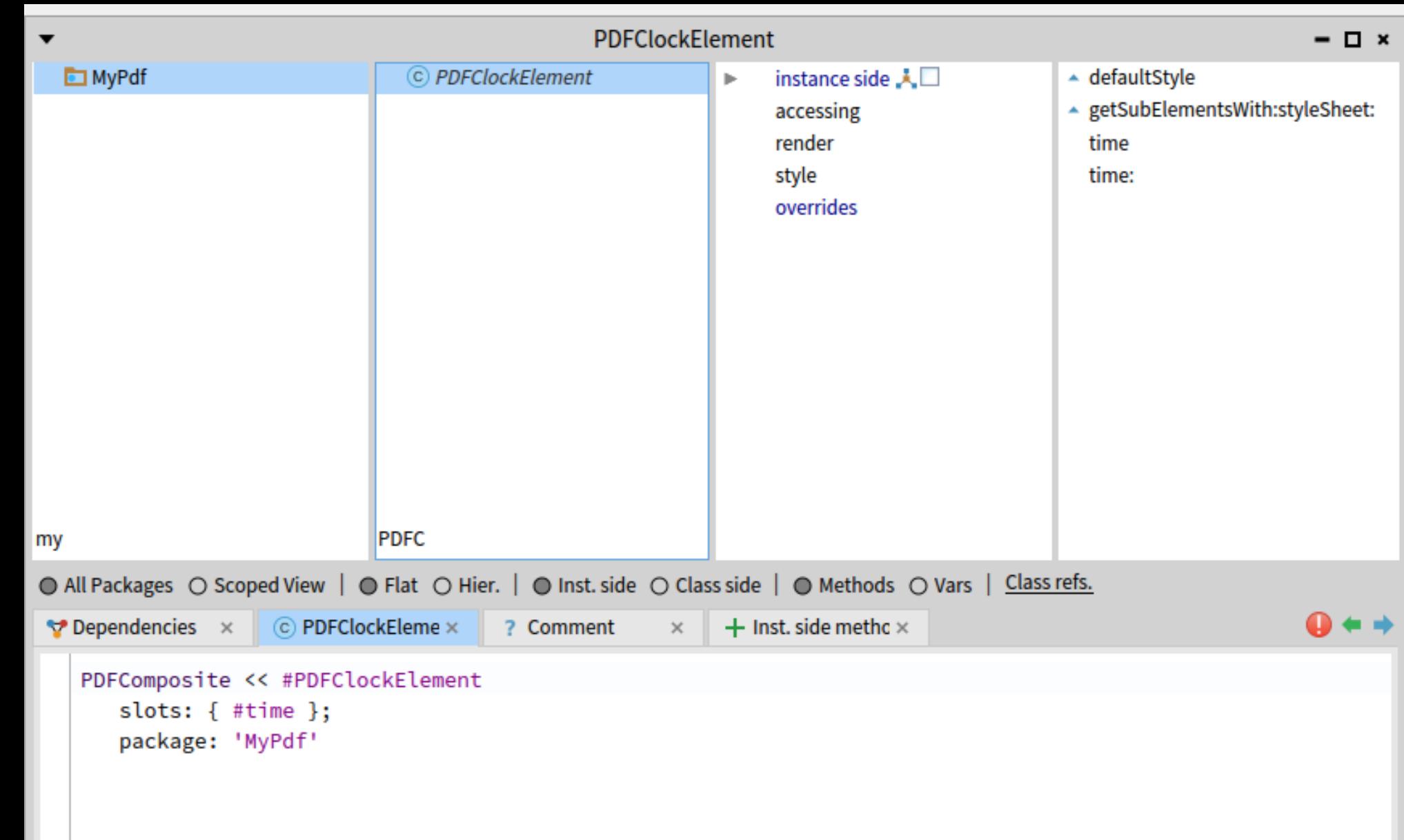
Dependencies PDFDataComment Comment acceptVisitor: Inst. side methc

acceptVisitor: aVisitor

aVisitor visitPDFDataComment: self

FACILEMENT UTILISABLE ?

Visitor



PDFClockElement>>getSubElementsWith:styleSheet:

MyPdf

PDFClockElement

instance side A □

accessing
render
style
overrides

defaultStyle
getSubElementsWith:styleSheet:
time
time:

my PDFC

All Packages Scoped View Flat Hier. Inst. side Class side Methods Vars Class refs. Implementors Senders

Dependencies PDFClockEleme Comment getSubElement Inst. side methc

```
getSubElementsWith: aGenerator styleSheet: aStyleSheet
| hourAngle minuteAngle |
hourAngle := Float pi / 2 - (time hour12 * 2 * Float pi / 12).
minuteAngle := Float pi / 2 - (time minute * 2 * Float pi / 60).

^ { (PDFCircleElement from: self from to: self to).
  (PDFCircleElement center: self center radius: self dimension x * 0.05),
  (PDFArrowElement from: self center angle: hourAngle length: dimension x * 0.25),
  (PDFArrowElement from: self center angle: minuteAngle length: dimension x * 0.45) }
```

```
colorTest: aStream
    "generate a sample document with colors"

    | pdfdoc aPage |
pdfdoc := PDFDocument new.

aPage := PDFPage new.
aPage add: (PDFCellElement new
    font: (PDFTimesFont new fontSize: 32pt);
    from: 10mm@10mm;
    dimension: 100 mm @ 20 mm;
    text: 'Hello World!';
    textColor: (PDFColor r: 255 g: 0 b: 0);
    fillColor: (PDFColor r: 0 g: 255 b: 0)
).
aPage add: (PDFRectElement new
    from: 10 mm @ 50 mm;
    dimension: 50 mm @ 50 mm;
    thickness: 5pt;
    drawColor: (PDFColor r: 0 g: 0 b: 255);
    fillColor: (PDFColor r: 0 g: 255 b: 0)
).

pdfdoc add: aPage.

pdfdoc exportTo: aStream
```