March 1, 2016
EECE-514 Assignment 3

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Exercise 3.1:

1) **Ease of use.** PIT has an eclipse plugin but Javalanche is not integrated with Eclipse. PIT has way better documentation than Javalanche. PIT is highly more maintained and active than Javalanche which has only two committers on GitHub and was last updated four years ago.
2) **Mutation operators by default.**
   a. The *activated* Mutator operators for PIT are: conditionals boundary mutator, increments mutator, invert negative mutator, math mutator, negative conditionals mutator, return values mutator, void method calls mutator.
   b. The *deactivated* Mutator operators for PIT are: constructor calls mutator, inline constant mutator, non-void method calls mutator, remove conditionals mutator, experimental member varaiable mutator, experimental switch mutator.
   c. The Mutator operators for Javalanche are: Replace constants, negate jump, arithmetic replace, remove call, replace variable, absolute value, unary operator.
3) **Mutation testing strategy and effectiveness.** Javalanche supports equivalent mutation while PIT doesn't. PIT supports most of Mock frameworks such as JMock, EasyMock, Mockito, PowerMock and JMockit, however, javalanche is not known to support any.

I would select to use the PIT mutation tool over Javalanche because it appears more active, stable and very well documented.

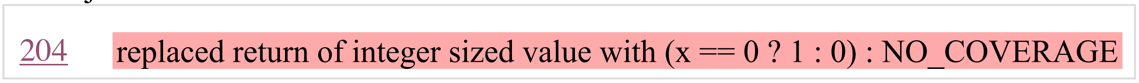
Exercise 3.2

Total PIT mutations: 33
Mutants Killed: 30
Mutants Alive: 3

Classes	Mutation Coverage	Percentage (%)
DefaultGameFactory.java	7/7	100
Board.java	7/7	100
Game.java	6/7	86
PointManager.java	7/7	86
Sprite.java	3/5	60

Exercise 3.3

Game.java



```
204    replaced return of integer sized value with (x == 0 ? 1 : 0) : NO_COVERAGE
```

The mutant in Line 204 is still alive because no test case exists in the unit test suite that kills the RETURN_VALS_MUTATOR.

Sprite.java

82	mutated return of Object value for org/jpacman/framework/model/Sprite::getSpriteType to (if (x != null) null else throw new RuntimeException) : NO_COVERAGE
87	mutated return of Object value for org/jpacman/framework/model/Sprite::toString to (if (x != null) null else throw new RuntimeException) : NO_COVERAGE

The mutant in Line 82 and 87 is still alive because no test case exists in the unit test suite that kills the RETURN_VALS_MUTATOR.

The mutations not killed by the test suite are weaknesses of the test suite because there have no tests that exercised the line of code where the mutation was created. Additionally, there was no difference in mutation coverage results observed when correct test cases are added and the mutants were killed.

The mutation score of the test suite is the # of killed mutants / (total number of mutants – equivalents mutants). But, since there are no known equivalent mutants in this test run it is the # of killed mutants/total number of mutants which 91%.

Exercise 3.4

Total PIT mutations: 33
Mutants Killed: 33
Mutants Alive: 0

Classes	Mutation Coverage	Percentage (%)
DefaultGameFactory.java	7/7	100
Board.java	7/7	100
Game.java	7/7	100
PointManager.java	7/7	100
Sprite.java	5/5	100

Code Snippets

SpriteTest.java

```
@Test

public void testGetSpriteType() {
```

```
assertEquals(SpriteType.OTHER, john.getSpriteType());

}
```

SpriteTest.java

```
@Test

public void testToString() {

assertEquals("OTHER occupying [0,0]", john.toString());

}
```

GameTest.java

```
@Test

public void testWon() throws FactoryException {

Game g = makePlay("P.. ");

g.movePlayer(Direction.RIGHT);

assertFalse(g.won());

g.movePlayer(Direction.RIGHT);

assertTrue(g.won());

}
```