Lab 1 Report

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1 Test Plan

1.1 Test requirements

The Lab 1 requires to (1) select **15 methods** from **6 classes** of the SUT (GeoProject), (2) design Unit test cases based on the experience or intuition for the selected methods, (3) develop test scripts to implement the test cases, (4) execute the test script on the selected methods, and (5) report the test results.

In particular, based on the statement coverage criterion, the **test requirements** for Lab 1 are to design test cases for each selected method so that "*each statement of the method will be covered by <u>at least one test case</u>* and *the <u>minimum</u> statement coverage is 40%*".

1.2 Strategy

To satisfy the test requirements listed in Section 1, a proposed strategy is to

(1) select those <u>public</u> methods that are easy to understand and have <u>primitive types</u> of input and output parameters (if possible).

(2) set the objective of the minimum statement coverage to be 50% initially and (if necessary) adjust the objective based on the time available.

(3) learn the necessary skills and tools as soon as possible.

(4) design the test cases for those selected methods by considering
   i. the possible **valid values** and **combinations** of the <u>input parameters</u>.
   ii. the **boundary values** of the <u>input parameters</u>.

1.3 Test activities

To implement the proposed strategy, the following activities are planned to perform.

No.	Activity Name	Plan hours	Schedule Date
1	Study GeoProject	0.25	2024/2/24
2	Learn JUnit	0.25	2024/2/24
3	Design test cases for the selected methods	1	2024/2/29
4	Implement test cases	2	2024/2/29
5	Perform test	2	2024/2/29
6	Complete Lab1 report	1	2024/2/29

1.4 Success criteria

All test cases designed for the selected methods must pass (or "90% of all test cases must pass) and *the statement coverage should have achieved at least 80%*.

2 Test Design

To fulfill the test requirements listed in section 1.1, the following methods are selected and corresponding test cases are designed.

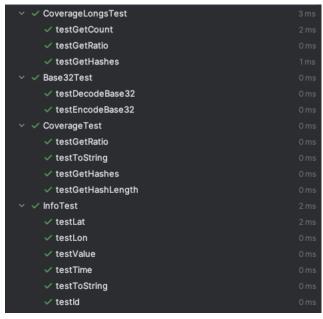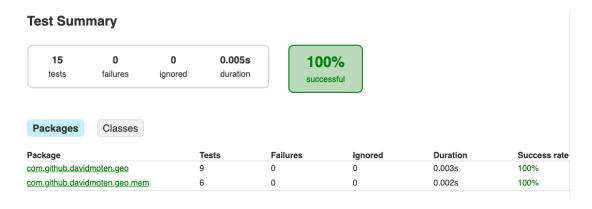| No.	Class	Method	Test Objective	Inputs	Expected Outputs
1	Info	id()	Info	N/A	taipeiId
2	Info	lat()	Info	N/A	25.104397
3	Info	lon()	Info	N/A	121.597366
4	Info	time()	Info	N/A	1708757706
5	Info	value()	Info	N/A	taipei
6	Info	toString()	Info	N/A	Info [lat=25.105497, lon=121.597366, time=1708757706, value=taipei, id=Optional.of(taipeiId)]
7	Coverage	getHashes()	Coverage	N/A	wsqqqjhw9yw767cn, xn77jk5fzrzf8rc2
8	Coverage	getRatio()	Coverage	N/A	0.5
9	Coverage	getHashLength()	Coverage	N/A	16
10	Coverage	toString()	Coverage	N/A	Coverage [hashes=[wsqqqjhw9yw767cn, xn77jk5fzrzf8rc2], ratio=0.5]
11	Coverage Longs	getHashes()	CoverageLongs	N/A	8703398685819821410, 7729896939150581108
12	Coverage Longs	getRatio()	CoverageLongs	N/A	0.5
13	Coverage Longs	getCount()	CoverageLongs	N/A	2
14	Base32	encodeBase32()	Base32	75324, 4	29jw
15	Base32	decodeBase32()	Base32	29jw	75324

3   Test Implementation

The design of test cases specified in Section 2 was implemented using JUnit 4. The test scripts of 3 selected test cases are given below. The rest of test script implementations can be found in the <u>link</u> (or JUnit files).

No.	Test method	Source code
1	testMethod1()	...
2	testMethod2()	...
3	testMethod3()	...

4   Test Results

4.1   JUnit test result snapshot

4.2   Code coverage snapshot

- Coverage of each selected method

- Total coverage

geo

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods	Missed	Classes
com.github.davidmoten.geo		19%		9%	130	149	293	348	52	68	7	10
com.github.davidmoten.geo.mem		19%		0%	23	30	48	61	13	20	2	3
com.github.davidmoten.geo.util		0%		0%	4	4	6	6	2	2	1	1
Total	1,878 of 2,326	19%	171 of 186	8%	157	183	347	415	67	90	10	14

4.3 CI result snapshot (3 iterations for CI)

- CI#1

- CI#2

- CI#3

README.md

pipeline `passed`

coverage `18%`

- **CI Pipeline**

Status	Pipeline	Commit	Stages	
⊘ passed	#4562 by 👤 latest	�ᛈ master -o- 73515978 👤 refactor: 💡 remove unused setup an...	✓ ✓	⏱ 00:06:35 📅 less than a minute ago
⊘ passed	#4561 by 👤	�ᛈ master -o- cbccb54b 👤 test: 🧪 implement tests for Base32	✓ ✓	⏱ 00:04:26 📅 less than a minute ago
⊘ passed	#4559 by 👤	� master -o- 7dbafb37 👤 test: 🧪 implement test cases for Co...	✓ ✓	⏱ 00:02:38 📅 about 2 hours ago
⊘ passed	#4529 by 👤	⟶ master -o- 9578e795 👤 chore: 🍱 add pipeline status and co...	✓ ✓	⏱ 00:01:30 📅 a week ago
⊘ passed	#4527 by 👤	⟶ master -o- 66fd7578 🟢 chore: 🍱 add pipeline status and co...	✓ ✓	⏱ 00:01:53 📅 a week ago
⊘ passed	#4525 by 👤	⟶ master -o- 6f74d9ce 👤 chore: 🍱 add pipeline status and co...	✓ ✓	⏱ 00:03:41 📅 a week ago

5   Summary

In Lab 1, **15 test cases have been designed and implemented using JUnit**. The test is conducted in 3 CI and **the execution results of the 15 test methods are all passed**. **The total statement coverage of the test is 28%.** Thus, the test requirements described in Section 1 are satisfied. Some lessons learned in this Lab are …

1. Learned how to use JUnit
2. Learned how to generate test reports and test coverage reports