Test Report: Stock Market Management System

Overview

The functionalities of the **Stock Market Management System** were also tested with the aim of achieving code quality from the aspects of functionality and mechanism robustness. Specific are stock management, portfolio operations, daily user balance checking and transaction history management, and so on, as well as potential scenarios such as low balance or invalid operation.

Execution Summary

The test suite was run using the unittest testing framework. All of the defined 12 test cases are passed successfully which assured the normal functionality of the fundamental operations of the system. The outcomes were assessed for coverage and mutation testing and hence to find out the weaknesses of the code.

```
1 !git clone https://github.com/KishoreMunagala/Stocks.git
```

```
Cloning into 'Stocks'...
remote: Enumerating objects: 21, done.
remote: Counting objects: 100% (21/21), done.
remote: Compressing objects: 100% (20/20), done.
remote: Total 21 (delta 5), reused 0 (delta 0), pack-reused 0 (from 0)
Receiving objects: 100% (21/21), 9.70 KiB | 9.71 MiB/s, done.
Resolving deltas: 100% (5/5), done.
```

CLOC:

```
1 !apt-get install cloc
2 !cloc stocks.py test_file.py
```

```
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
cloc is already the newest version (1.90-1).
0 upgraded, 0 newly installed, 0 to remove and 49 not upgraded.
       2 text files.
       2 unique files.
       0 files ignored.

github.com/AlDanial/cloc v 1.90  T=0.01 s (138.6 files/s, 24952.9 lines/s)
-------------------------------------------------------------------------------
Language                     files          blank        comment           code
-------------------------------------------------------------------------------
Python                           2             69             40            251
-------------------------------------------------------------------------------
SUM:                             2             69             40            251
-------------------------------------------------------------------------------
```

Unit Test

```
!pip install tstl
!python -m unittest test_file.py
```

```
Requirement already satisfied: tstl in /usr/local/lib/python3.10/dist-packages (1.2.39)
Requirement already satisfied: coverage==4.5.2 in /usr/local/lib/python3.10/dist-packages (from tstl) (4.5.2)
Bought 10 shares of Apple Inc. (AAPL).
..Bought 10 shares of Apple Inc. (AAPL).
Sold 5 shares of AAPL.
Sold 5 shares of AAPL.
.Bought 5 shares of Apple Inc. (AAPL).
....Bought 10 shares of Apple Inc. (AAPL).
...Bought 10 shares of Apple Inc. (AAPL).
Sold 5 shares of AAPL.
.Bought 10 shares of Apple Inc. (AAPL).
Sold 5 shares of AAPL.
.
----------------------------------------------------------------------
Ran 12 tests in 0.002s

OK
```

Results

- **Tests Passed**: All 12 test cases passed without errors.
- **Execution Time**: The tests completed in 0.007 seconds.
- **Code Coverage**: The overall coverage of the stocks.py file was 44%, with key gaps in error-handling and logging-related lines.
- **Mutation Testing**: The system achieved a mutation score of 71.0%, with 31 mutations introduced, of which 22 were killed. Nine mutations survived, indicating areas where the test suite could be strengthened.

Key Findings

Strengths:

1. Each essential operation such as stock acquisition, selling, and portfolio tracking were seamless.
2. There were error logs and response to conditions like inadequate balance and attempts to sell over the quantity posses by the user.
3. Transaction history and the balance of the users were implemented as well as verified correctly.

Improvement Areas:

1. **Code Coverage**: Some of these not testable parts of the stocks.py file are the logging and the error handling part of the code. Increasing the coverage is crucial in order achieve higher levels of reliability.

```
!pip install coverage
!coverage run test_file.py
!coverage report -m
```

```
----------------------------------------------------------------------
Ran 12 tests in 0.007s

OK
Name                                                                                Stmts   Miss  Cover   Missing
-----------------------------------------------------------------------------------------------------------
stocks.py                                                                             180    100    44%   21, 29, 33, 37, 48, 56-57, 69-79, 87, 91, 95,
test_file.py                                                                           64      0   100%
/usr/local/lib/python3.10/dist-packages/_distutils_hack/__init__.py                   101     96     5%   2-102, 112-240
-----------------------------------------------------------------------------------------------------------
TOTAL                                                                                 345    196    43%
```

2. **Mutation Testing**: Certain mutations remained intact, implying that more test cases are required to cater for rare situations or under other circumstances.

```
!pip install mutpy
!mut.py --target stocks.py --unit-test test_file.py --runner 'unittest' --coverage
```

```
[0.00969 s] survived
[*] Mutation score [24.81188 s]: 71.0%
   - all: 31
   - killed: 22 (71.0%)
   - survived: 9 (29.0%)
   - incompetent: 0 (0.0%)
   - timeout: 0 (0.0%)
[*] Coverage: 594 of 1471 AST nodes (40.4%)
```

Conclusion

The system test result demonstrates that all the basic features of the **Stock Market Management System** were functioning properly. All in all the current test suite shows moderate strength (mutation score of 71.0%) the identified surviving mutants if further tested will enhance the reliability of the system and the tests. The system is fairly well for further developments and improvements.

GitHub Link: https://github.com/KishoreMunagala/Stocks