

SECTION 1

1-

- Helps improve quality of code
- Ensures that new features, or changes don't break existing code base.
- Check software's validity under all possible scenarios and increases code stability.
- Unit tests help find bugs easily, early (before integrating pieces together).

2-

Mocking is library for testing in Python which allows us to replace parts of system under test with [mock objects](#) and make assertions about how they are used. A [mock object](#) substitutes and imitates real object within testing environment.

Advantages-

- Tests can be easily isolated from their dependencies, thus limiting them to small scope helping one write short, more focused tests.
- Mocking database interactions can help speed tests.
- Developing with mock objects is good technique for discovering interface of real object.

Disadvantages-

- When interface of object changes, tests relying on Mock of that object become irrelevant. If external dependency changes its interface, mock objects become invalid.

Mocks make refactoring harder.

- Mocks add unnecessary complexity to code design.
- Can lead to overspecification of tests.
- Work on assumption that external modules work.

Mocks are generally used in unit tests, to isolate, focus on code being tested, not on behaviour, state of external dependencies.

3-

- In spring, 2018, software bug was detected in F-35 Joint Strike Fighter air crafts, that made it incorrectly detect targets in formation

- In 2017, UK's National Health Service admitted to mis-prescribing medication to over 300,000 heart patients due to [software error](#). It produced incorrect results, leading to patients suffering from otherwise preventable strokes.

SECTION 2

1-BFS

STRENGTHS-

- Never get trapped in infinite loops.
- If solution exists, it finds one with minimal steps.

WEAKNESSES-

- Consumes huge memory especially when tree's branching factor is huge.
- Time complexity is more

WHEN TO USE-

- Finding Shortest Path.
- Checking graph with bipartiteness.
- Locating nearest nodes in peer to peer network.

2-DFS

STRENGTHS-

- Memory requirement -linear with respect to nodes
- Requires less memory than BFS.

WEAKNESSES-

- Can get trapped into infinite loops.
- May take long time to visit neighbouring nodes if tree depth is huge
- Not guaranteed to give solution.

WHEN TO USE-

- To exhaust all possibilities, find best/count number of possibilities.
- Cycle detection
- In weighted graph, DFS generates shortest path tree, minimum spanning tree.
- Topological sorting.

3- NO. Even if start and end cell are very close, configuration can be designed such that player has to take long route to collect water buckets, and cross fire covering exit.

The time taken depends collectively on configuration and search mode.

4- In our game, we need to check every game state -player row, column and number of water buckets, instead of just player's position. Hence, we cannot keep a list of visited cells. Acorn might have to go to same position again but with different attributes (num_water_buckets)

Example-

*A***
* 2**
*W***
* *
FFF
* *
*F2 *
*Y***

You have 0 water buckets.

Move : s

*X***
*A2**
*W***
* *
FFF
* *
*F2 *
*Y***

You have 0 water buckets.

Move : s

*X***
* 2**
*A***
* *
FFF
* *
*F2 *
*Y***

You have 1 water bucket.

Move : w

*X***

*A2**

* ***

* *

FFF

* *

*F2 *

*Y***

You have 1 water bucket.

Move : d

*X***

* 2**

* ***

* *

FFF

* *

*FA *

*Y***

You have 1 water bucket.

Move : a

*X***

* 2**

* ***

* *

FFF

* *

*A2 *

*Y***

You have 0 water buckets.

Move : s

*X***
* 2**
* ***
* *
FFF
* *
* 2 *
*A***

You have 0 water buckets.

Player had to come back to cell in first row first column after collecting water bucket.

References-

Bettilyon,2019,Breadth First Search and Depth First Search,
<https://medium.com/tebs-lab/breadth-first-search-and-depth-first-search-4310f3bf8416>

Cruz,2014, Using Mocks in Python,
<https://www.drdoobbs.com/testing/using-mocks-in-python/240168251>

Fox News, 2015, Software Glitch causes F-35 to incorrectly detect targets in formation, <https://www.foxnews.com/tech/software-glitch-causes-f-35-to-incorrectly-detect-targets-in-formation>

Independent,2018, NHS medication errors contribute to as many as 22,000 deaths a year, major report shows,
<https://www.independent.co.uk/news/health/nhs-medication-errors-deaths-prescription-drugs-jeremy-hunt-york-university-health-a8224226.html>

Keen,2017,Implementing Dijkstra's Shortest Path Algorithm with Python,
<https://benalexkeen.com/implementing-dijkstras-shortest-path-algorithm-with-python/>

Ronquillo, 2016,Understanding the Python Mock Object Library,
<https://realpython.com/python-mock-library/>

Sharma,2020,Unit Testing in Python,
<https://www.datacamp.com/community/tutorials/unit-testing-python>

