Section 1 - Testing:

1.
- To ensure a program runs properly before the actual use of the program
- Test cases can be rerun after modifications to code, to ensure correct operation
- Less time and money is spent to develop and debug code

2.
Mock testing:
- A mock object is an object that stimulate the behaviour of another object in the system, that attaches to the code tested and record function calls
- Purpose is to isolate and focus on the code tested not on external dependencies

Advantages:
- Unit testing can be done without restraints of external dependencies, making testing faster
- The cause of a failure of a test can be determined to be the unit being tested, and not due to other objects

Disadvantages:
- Mocks add complexity to code
- Mock objects will not change with the external environment. Mock tests may pass, but the unit may not operate in the external environment

Used during unit testing.

3.
Ariane 5 Flight 501
- A satellite launching rocket reused software from its predecessors, but there was an uncaught bug. It attempted to put a 64-bit number into a 16-bit space, leading to primary and backup computers crashing.
    - Lost $8 billion from development and a $500 million satellite

Section 2 - Solver:

1.
The advantage of BFS is that BFS can find the shortest path between two places, or the smallest number of moves. Additionally, if there is a solution to be found, BFS will be able to find it.
However, there are memory constraints, since it stores all nodes of the present level. Also, if the solution is far away, it can take a considerable amount of time.
BFS is most helpful to find the shortest path or link between places.

2.

DFS requires less memory than BFS, is better at finding a solution when it is further away from the source, and can be faster than BFS.

However, DFS doesn't guarantee that it'll find a solution or the most optimal solution. DFS may also get trapped in an infinite loop.

DFS is used for topological sorting, finding strongly connected components of graphs, and detecting cycles in graphs.

3.

BFS is generally better at finding the ending cell that is very close to the starting cell, however, if DFS happens to pick the correct path first time around, it will be faster than BFS. Hence, it is not guaranteed for DFS to be faster than BFS.

4.

The game has a fire and water aspect, which requires the player to sometimes retrace steps to retrieve water buckets to navigate past fires and win. For example, the player could go down a narrow pathway to get water, and retrace their steps to reach and extinguish a fire.

The player's number of water buckets attribute increases since the last time they were in that cell. Hence, using a list of visited cells to stop revisiting will sometimes prevent the solver from finding a solution.

References

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