

Hangman Game Project Report

Introduction

The goal of this project is to make a classic Hangman game in Python using **Test-Driven Development (TDD)** and automated unit testing. The game has two modes:

1. **Basic** – The game randomly picks a single word.
2. **Intermediate** – The game randomly picks a short phrase.

We chose Python because it is easy to work with text, and unittest makes automated testing simple. Using automated tests helps catch bugs early and ensures the game works as expected.

We also use the **NLTK library** as a source of real words, so the game can choose words dynamically instead of hardcoding them.

Process

1. Test-Driven Development (TDD)

We followed TDD for the whole project:

1. **Write tests first**
 - Made tests for picking words/phrases, showing underscores, updating correct guesses, handling wrong guesses, and detecting wins or losses.
2. **Build the game logic step by step**
 - Added methods like `_choose_word`, `_init_display`, `_update_display`, and the main game loop.
3. **Refactor and check tests**
 - Implemented timed input separately for Windows (`msvcrt`) and POSIX (`select`).
 - Ran tests after every new feature to make sure nothing broke.

2. Automated Unit Testing

We used Python's unittest module to test the game. Main tests include:

1. `test_initial_display` – Makes sure words/phrases show as underscores correctly.

2. `test_correct_guess_updates_display` – Checks if correct letters reveal properly.
3. `test_incorrect_guess_deducts_life` – Confirms that wrong letters reduce lives.
4. `test_is_won` and `test_is_lost` – Make sure win and loss conditions are detected.
5. `test_choose_word_basic` and `test_choose_word_intermediate` – Checks that random picks come from valid word lists.

```

D: > javaxx > hangman1_test.py > TestHangmanGame > test_initial_display
7 class TestHangmanGame(unittest.TestCase):
18
19 def test_initial_display(self):
20     """Test initial display string has underscores."""
21     self.assertEqual(self.word_game.display_word, "____")
22     self.assertEqual(self.phrase_game.display_word, "____ _")
23
24 def test_correct_guess_updates_display(self):
25     """Test correct letter guess updates display."""
26     self.word_game._update_display("p")
27     self.assertEqual(self.word_game.display_word, "_pp_")
28
29     self.phrase_game._update_display("t")
30     # Correct expected display after guessing 't'
31     self.assertEqual(self.phrase_game.display_word, "___t t__t")
32
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34
35 def test_incorrect_guess_deducts_life(self):
36     """Test wrong letter guess decreases lives."""
37     initial_lives = self.word_game.lives
38     if "z" not in self.word_game.answer:
39         self.word_game.guessed_letters.add("z") # simulate wrong guess
40         self.word_game.lives -= 1
41     self.assertEqual(self.word_game.lives, initial_lives - 1)
42
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

PS C:\Users\ingram> & C:\Users\ingram\AppData\Local\Programs\Python\Python310\python.exe d:/javaxx/hangman1_test.py
.....
Ran 7 tests in 0.003s

OK
PS C:\Users\ingram>

```

```

C:\Windows\System32\cmd.exe
D:\javaxx>flake8 hangman1.py
D:\javaxx>pylint hangman1.py

-----
Your code has been rated at 10.00/10 (previous run: 9.93/10, +0.07)

D:\javaxx>

```

3. Implementation Highlights

1. Classes & Methods

- `HangmanGame` class handles all the game logic.

- Key methods: `_choose_word`, `_init_display`, `_update_display`, `is_won`, `is_lost`, `timed_input`, `play`.

2. Timed Input

- Windows uses `msvcrt`, POSIX uses `select`.
- Each guess has a 15-second timer.

3. Word Sources

- Words come from NLTK's words corpus.
- Phrases can come from NLTK's brown corpus or a predefined list.

Choose mode:

```

1  """Hangman game using Python and NLTK corpus."""
2
3  import os
4  import sys
5  import time
6  import random
7  import nltk
8
9  # NLTK corpus imports
10 try:
11     from nltk.corpus import words as nltk_words
12     from nltk.corpus import brown
13 except ImportError:
14     nltk.download("words", quiet=True)
15     nltk.download("brown", quiet=True)
16     from nltk.corpus import words as nltk_words
17     from nltk.corpus import brown
18
19 # Conditional imports for timed input
20 MSVCRT = None
21 SELECT_MODULE = None

```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

```

PS C:\Users\ingram> & C:/Users/ingram/AppData/Local/Programs/Python/Python310/python.exe d:/javaxx/hangman1.py
Choose game mode:
1. Basic (single word)
2. Intermediate (phrase)
Enter 1 or 2:

```

Timer:

```
1 """Hangman game using Python and NLTK corpus."""
2
3 import os
4 import sys
5 import time
6 import random
7 import nltk
8
9 # NLTK corpus imports
10 try:
11     from nltk.corpus import words as nltk_words
12     from nltk.corpus import brown
13 except ImportError:
14     nltk.download("words", quiet=True)
15     nltk.download("brown", quiet=True)
16     from nltk.corpus import words as nltk_words
17     from nltk.corpus import brown
18
19 # Conditional imports for timed input
20 MSVCRT = None
21
22 PS C:\Users\ingram> & C:/Users/ingram/AppData/Local/Programs/Python/Python310/python.exe d:/javaxx/hangman1.py
Choose game mode:
1. Basic (single word)
2. Intermediate (phrase)
Enter 1 or 2: 1
Welcome to Hangman!
Game Mode: Basic
You have 6 lives. Guess letters to reveal the word/phrase.
You have 15 seconds per guess.

Lives left: 6
Word: - - - - -
Enter a letter: 7s
```

guessing wrong:

```
1 """Hangman game using Python and NLTK corpus."""
2
3 import os
4 import sys
5 import time
6 import random
7 import nltk
8
9 # NLTK corpus imports
10 try:
11     from nltk.corpus import words as nltk_words
12     from nltk.corpus import brown
13 except ImportError:
14     nltk.download("words", quiet=True)
15     nltk.download("brown", quiet=True)
16     from nltk.corpus import words as nltk_words
17     from nltk.corpus import brown
18
19 # Conditional imports for timed input
20 MSVCRT = None
21
22 PS C:\Users\ingram> & C:/Users/ingram/AppData/Local/Programs/Python/Python310/python.exe d:/javaxx/hangman1.py
Choose game mode:
1. Basic (single word)
2. Intermediate (phrase)
Enter 1 or 2: 1
Welcome to Hangman!
Game Mode: Basic
You have 6 lives. Guess letters to reveal the word/phrase.
You have 15 seconds per guess.

Lives left: 6
Word: - - - - -
Enter a letter: 0s
Time is up! You lost a life.

Lives left: 5
Word: - - - - -
Enter a letter: 0s
Time is up! You lost a life.

Lives left: 4
Word: - - - - -
Enter a letter: a 7s
Wrong! Letter 'a' is not in the word.

Lives left: 3
Word: - - - - -
Enter a letter: 11s
```

Guessing correctly:

```
D:\> javacx > hangman.py > ...
1  """Hangman game using Python and NLTK corpus."""
2
3  import os
4  import sys
5  import time
6  import random
7  import nltk
8
9  # NLTK corpus imports
10 try:
11     from nltk.corpus import words as nltk_words
12     from nltk.corpus import brown
13 except ImportError:
14     nltk.download("words", quiet=True)
15     nltk.download("brown", quiet=True)
16     from nltk.corpus import words as nltk_words
17     from nltk.corpus import brown
18
19 # Conditional imports for timed input
20 MSVCRT = None
21 if sys.platform == "win32":
22     import msvcrt as MSVCRT
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Conclusion

1. Lessons Learned

1. TDD really helps you write code confidently.
2. Automated tests make it safe to refactor and add features.
3. Following PEP8 and pylint makes code neat and easy to read.
4. Testing edge cases, like repeated letters and phrases with spaces, is important to ensure the game behaves correctly for all users.

2. What Can Be Improved

1. Add difficulty levels with longer words or tricky phrases.
2. Improve the UI for a nicer user experience, maybe even a GUI version.

GitHub Repository: https://github.com/liangmich/Hangman_Assignment