Wordle Solver – ALGO3 ISIL

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1. Strategy Description

Part 1 – Wordle Game (Human Player):

- The program selects a random target word from the dictionary (`words.txt`).
- The player has 6 attempts to guess the word.
- After each attempt, the program provides feedback for each letter:
  - 'G' (Green): Correct letter in correct position
  - 'Y' (Yellow): Letter exists in the word but wrong position
  - '_' (Gray): Letter not present

Part 2 – Wordle Solver (Automatic):

- The program starts with no prior knowledge of the target word.
- It guesses the first word from the candidate list.
- Calculates feedback for each letter (result array).
- Filters the candidate list to keep only words compatible with previous feedback.
- Repeats until the target word is found or attempts run out.

Effectiveness: Using feedback to filter candidates quickly reduces the possible words, ensuring fewer guesses.

2. Data Structure Justification

Structures used:

- Dictionary array: `char words[MAX_WORDS][WORD_LENGTH + 1]` – stores all words from `words.txt`
- Candidate array: `char candidates[MAX_WORDS][WORD_LENGTH + 1]` – stores possible words after each guess
- Result array: `char result[WORD_LENGTH + 1]` – stores feedback for each letter

Alternative structures considered:

- Linked list: dynamic removal of candidates
- Hash table: faster searching of compatible words

Reason for using arrays: Simple to implement and sufficient for small/medium dictionary sizes.

3. Complexity Analysis

Time complexity:

- Reading dictionary: $O(N)$ where N is number of words
- Each guess:
  - Compare each candidate: $O(M \cdot L)$ (M = number of candidates, L = word length)
  - Filtering candidates: $O(M \cdot L)$

Space complexity:

- Dictionary array: $O(N \cdot L)$
- Candidate array: $O(N \cdot L)$
- Result array: $O(L)$

4. Code Documentation

print_feedback / check_letters

- Purpose: Print feedback for each guess (Part 1) / calculate letter feedback (Part 2)
- Inputs: `guess` (guessed word), `target` (secret word)
- Outputs: Feedback array showing 'G', 'Y', '_'

is_valid

- Purpose: Check if a candidate word is compatible with previous guess feedback
- Inputs: `word` (candidate), `guess`, `result` (feedback)
- Output: 1 if compatible, 0 otherwise

5. Sample Output

Part 1 – Human Player:

```
Bienvenue dans Wordle!
Vous avez 6 essais pour deviner le mot de 5 lettres.

Essai 1: TABLE
[Y][ ][ ][ ][Y]  TABLE

Essai 2: PLACE
[G][G][G][G][G]  PLACE

F licitations! Vous avez trouv  le mot!
```

Part 2 – Wordle Solver:

```
=== Wordle Solver ===
Essai 1: TABLE -> Y__Y_
Essai 2: PLATE -> GGGY_
Essai 3: PLACE -> GGGGG
Word correct!
```