



高级编程技术实验报告

实验三：Word Game

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一、问题描述及求解思路

实现一个单词游戏(word game)。每轮游戏会发给玩家几张字母牌，通过组合字母牌上的字母组合出单词。

1. 单词分数

`get_word_score`将单词`word`转为小写后，遍历其中的每一个字母，并在`SCRABBLE_LETTER_VALUES`中获取该字母的分数。将分数累加即得该单词的得分。

2. 处理手牌

`update_hand`用于出了一次完整单词后更新手牌内容及数目。将遍历打出的单词`word`中的每一个字母，通过`get`函数获得其是否在手牌中出现，以避免出现错误情况（即0张手牌但没有从字典中清除的情况）。如果出现，则对该字母对应的手牌数减1。

3. 单词合法性

`is_valid_word`先将`word`中的字母全部转为小写，然后遍历`word_list`，判断该小写单词是否在单词表中。另外，还需用类似`update_hand`的方法判断`word`中的字母是否全部由原有的手牌构成。

4. 通配符

注意通配符(wildcard)只能替代元音字母。

`is_valid_word`中添加通配符的判断：如果存在通配符，则遍历所有元音字母，并替换掉通配符，尝试匹配单词表`word_list`中的单词。若对于所有元音字母替换，都找不到对应的单词，则说明`word`不是一个合法的单词。如果没有通配符，则代码实现逻辑与上题相同。

`deal_hand`按照题目叙述的方式进行实施，减少一个元音位置，留给通配符使用。注意要在程序引言区添加`WILDCARD`变量。处理`hand`时同样用了`get`方法字典匹配不成功报错。

5. 出牌实施

游戏规则见题目要求，在此不再赘述。

`play_hand`函数具体实施如下

1. 初始化分数计数器`total_score`为0
2. 当手上还有牌时，进入`while`循环

3. 用`display_hand`展示当前手牌
4. 请求用户输入，如果输入为!!则结束游戏，否则继续进行
5. 用`is_valid_word`判断用户单词是否合法，如果合法则得分`get_word_score`，否则输出错误提示信息
6. 用`update_hand`更新手牌，回到2（注意即使不合法的单词也会消耗手牌!）
7. 如果手上没牌或得到!!输入，则游戏结束
8. 输出用户最终得分

6. 完整游戏实施

`substitute_hand`用于替换手牌，方法与生成手牌的方法类似，即利用`random.choice`方法随机生成。然后将新生成的手牌结如其中，将原指定手牌丢弃。注意是替换字母，而不是替换单一手牌，即如果一个字母对应的手牌有多张，则需要全部替换。

`play_game`的实施如下

- 用户输入玩牌轮数`n_hands`
- 在每一手牌开始之前询问用户是否需要替换手牌，如果需要则询问需要替换哪一张牌，且此操作只能被使用一次，用`flag_sub`记录。
- 每一轮手牌结束之后询问用户是否回放上一轮的手牌，如果回放则不给予用户新的手牌。该操作只能用一次，用`flag_replay`记录，但不计入用户的玩牌轮数，且不再拥有替换牌的权利。

二、 代码

代码实施及注释请见附件`ps3.py`。

三、 运行截图

实验运行结果如下面几幅图片所示，且测试了不同样例，以针对不同分支，确保结果的正确性和鲁棒性。

```

chhzh123@DESKTOP-PV2UBJL: /mnt/d/Assignments/AdvancedComputerProgramming/ps3
chhzh123@DESKTOP-PV2UBJL: /mnt/d/Assignments/AdvancedComputerProgramming/ps3$ python3 test_ps3.py
Loading word list from file...
  83667 words loaded.

-----
Testing get_word_score...
SUCCESS: test_get_word_score()
-----
Testing update_hand...
SUCCESS: test_update_hand()
-----
Testing is_valid_word...
SUCCESS: test_is_valid_word()
-----
Testing wildcards...
SUCCESS: test_wildcard()
All done!
chhzh123@DESKTOP-PV2UBJL: /mnt/d/Assignments/AdvancedComputerProgramming/ps3$

```

图 1: 测试样例全部通过

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chhzh123@DESKTOP-PV2UBJL: /mnt/d/Assignments/AdvancedComputerProgramming/ps3
chhzh123@DESKTOP-PV2UBJL: /mnt/d/Assignments/AdvancedComputerProgramming/ps3$ python3 ps3.py
Loading word list from file...
  83667 words loaded.
Enter total number of hands: 2
Current Hand: a i * h r b x

Would you like to substitute a letter? no
Current Hand: a i * h r b x
Please enter a word, or "!!" to indicate that you are done: hir*
"hir*" earned 114 points. Total: 114 points

Current Hand: a b x
Please enter a word, or "!!" to indicate that you are done: bax
That is not a valid word. Please choose another word.

Ran out of letters. Total score for this hand: 114 points
-----
Would you like to replay the hand? no
Current Hand: a o * z k s x

Would you like to substitute a letter? yes
Which letter would you like to replace: z

Current Hand: a o * k s x v
Please enter a word, or "!!" to indicate that you are done: as
"as" earned 2 points. Total: 2 points

Current Hand: o * k x v
Please enter a word, or "!!" to indicate that you are done: ox
"ox" earned 45 points. Total: 47 points

Current Hand: * k v
Please enter a word, or "!!" to indicate that you are done: k*
"k*" earned 55 points. Total: 102 points

Current Hand: v
Please enter a word, or "!!" to indicate that you are done: !!
Total score for this hand: 102 points
-----
Would you like to replay the hand? yes
Current Hand: a o * k s x v
Please enter a word, or "!!" to indicate that you are done: kao
That is not a valid word. Please choose another word.

Current Hand: * s x v
Please enter a word, or "!!" to indicate that you are done: xsv
That is not a valid word. Please choose another word.

Current Hand: *
Please enter a word, or "!!" to indicate that you are done: !!
Total score for this hand: 0 points
-----
Total score over all hands: 216
chhzh123@DESKTOP-PV2UBJL: /mnt/d/Assignments/AdvancedComputerProgramming/ps3$

```

图 2: 完整游戏

```
chhzh123@DESKTOP-PV2UBJL: /mnt/d/Assignments/AdvancedComputerProgramming/ps3
chhzh123@DESKTOP-PV2UBJL: /mnt/d/Assignments/AdvancedComputerProgramming/ps3$ python3 ps3.py 10
Loading word list from file...
83667 words loaded.
Enter total number of hands: 2
Current Hand: i i o * t t d p r m

Would you like to substitute a letter? no
Current Hand: i i o * t t d p r m
Please enter a word, or "!!" to indicate that you are done: it
"it" earned 2 points. Total: 2 points

Current Hand: i o * t d p r m
Please enter a word, or "!!" to indicate that you are done: pro*
"pro*" earned 80 points. Total: 82 points

Current Hand: i t d m
Please enter a word, or "!!" to indicate that you are done: it
"it" earned 16 points. Total: 98 points

Current Hand: d m
Please enter a word, or "!!" to indicate that you are done: !!
Total score for this hand: 98 points
-----
Would you like to replay the hand? no
Current Hand: e e u * g w t j v

Would you like to substitute a letter? yes
Which letter would you like to replace: w

Current Hand: e e u * g t j v m m
Please enter a word, or "!!" to indicate that you are done: me
"me" earned 4 points. Total: 4 points

Current Hand: e u * g t j v m
Please enter a word, or "!!" to indicate that you are done: eugtjvm
That is not a valid word. Please choose another word.

Current Hand: *
Please enter a word, or "!!" to indicate that you are done: *
That is not a valid word. Please choose another word.

Ran out of letters. Total score for this hand: 4 points
-----
Would you like to replay the hand? no
Total score over all hands: 102
chhzh123@DESKTOP-PV2UBJL: /mnt/d/Assignments/AdvancedComputerProgramming/ps3$
```

图 3: 自己添加: 通过命令行传递参数指明手牌数目, 如此图中传递的是10