SIT323 Practical Software Development, Trimester 2, 2015

Assignment 2 - Crozzle Creation

Due Date

Monday 9:00am, October 5

Introduction

As outlined in the assignment 1 document, assignment 1 and 2 comprise parts of the one .Net C# project.

- Assignment 1 focused on loading data from files, validation, displaying a crozzle and its score.
- Assignment 2 will focus on loading data from one file to create a valid crozzle that has the highest possible score that you can achieve.

Software Requirements

Your software solution for assignment 2 can be an extension to your assignment 1 solution. It requires functionality to:

1. **Read a wordlist CSV file in order to create a crozzle**.

   Your code for such file reading can be based on your code from assignment 1. Clearly this CSV file provides the following essentials to create a new crozzle:
   a. the crozzle dimensions,
   b. a difficulty level, and
   c. a list of words.

2. **Compute and display the score of a valid crozzle**.

   This code might be based on your code from assignment 1.
   a. This score must be accurate.
   b. An invalid crozzle receives a score of 0.

3. **Create a valid crozzle based on a wordlist and constraints**.

   This is where you write new code to determine which subset of words from the wordlist, that when connected in some arrangement, produces the highest score and adheres to all constraints. Creating a new crozzle must be based on:
   a. a wordlist CSV file,
   b. the word constraints,
   c. the time constraints, and
   d. the scoring constraints.

4. **Save a created crozzle to a TXT file**.

   Based on assignment 1, your program should be able to open and display a saved crozzle too.

Constraints: Words, Time and Scoring

In general, there might be thousands or millions of crozzles that can be generated from a list of words, grid size, and constraints. Ideally your algorithm should find one of these crozzles with the maximum score, but practically this might be impossible in cases with large grids and a large number of words. As your algorithm might not meet this ideal goal, **your program must attempt to obtain a large score within a 5 minute time period (see common constraint #5)**.

When creating a crozzle, your assignment 2 software does not just place words into a rectangular grid in some random fashion, it must arrange words based on the following constraints (like those in assignment 1). But it must also determine which one of many arrangements of words has the largest score, i.e., your program needs to automatically find which crozzle has the greater score out of (ideally) all possible crozzles.

For example, many crozzles can be created using a 4 by 4 grid and the following small list of six words: BOAT, BOOK, CAT, OPAL, TILT and ZEBRA. Two such crozzles are:

B	O	O	K
	P		
C	A	T	
	L		

B	O	O	K
O		P	
A		A	
T	I	L	T

a) If we use the EASY constraints, the above two crozzle solutions are clearly worth:
   - 9 points and
   - 12 points.

b) Using the MEDIUM constraints, these two crozzles are worth:
   - 95 (2+15+15+11+16+3+1+20+12) points and
   - 137 (2+15+15+11+15+16+1+1+20+9+12+20) points.

c) Using the HARD constraints, these two crozzles are worth:
   - 125 (3*10 + 95) points and
   - 177 (4*10 + 137) points.

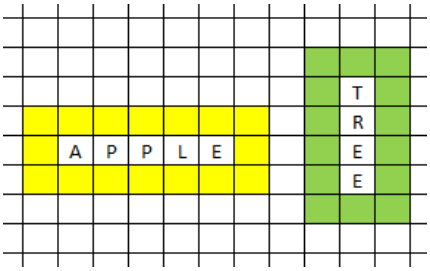
d) Using the HARD constraints, these two crozzles are worth:
   - 32 (3*10 + 1+1) points and
   - 63 (4*10 + 2+1+16+4) points.

Constraints (common to all crozzles)

1. Each sequence of two or more horizontal (vertical) characters delimited by spaces or the crozzle edge must form a word that can be found in the wordlist.
2. A word cannot be inserted in the crozzle more than once.
3. A word can be inserted horizontally but only run left to right.
4. A word can be inserted vertically but only run high to low.
5. **Each crozzle must be created within 5 minutes. That is, after 5 minutes runtime, your program must:**
   a. **stop looking for better crozzles,**
   b. **display the best crozzle that you found, and**
   c. **display its score.**

Constraints for the EASY difficulty level (in addition to the common constraints)

1. A horizontal word must only intersect 1 or 2 vertical words.
2. A vertical word must only intersect 1 or 2 horizontal words.
3. One point is scored for each letter within a valid crozzle.
4. A horizontal word cannot touch any other horizontal word. That is, there must be at least one grid space between a horizontal word and any other horizontal word. For example, no letter from any other horizontal word can be placed into the yellow region in the following diagram.
5. A vertical word cannot touch any other vertical word. That is, there must be at least one grid space between a vertical word and any other vertical word. For example, no letter from any other vertical word can be placed into the green region in the following diagram.



Constraints for the MEDIUM difficulty level (in addition to the common constraints)

1. A horizontal word must only intersect 1 or 2 vertical words.
2. A vertical word must only intersect 1 or 2 horizontal words.
3. Points are scored for each letter within a valid crozzle based on the following equivalences: A=1, B=2, C=3, D=4… X=24, Y=25, and Z=26.

Constraints for the HARD difficulty level (in addition to the common constraints)

1. A horizontal word must intersect 1 or more vertical words.
2. A vertical word must intersect 1 or more horizontal words.
3. 10 points are scored for each word placed from the word list into a valid crozzle.
4. Points are scored for each letter within a valid crozzle based on the following equivalences: A=1, B=2, C=3, D=4… X=24, Y=25, and Z=26.

Constraints for the EXTREME difficulty level (in addition to the common constraints)

1. A horizontal word must intersect 1 or more vertical words.
2. A vertical word must intersect 1 or more horizontal words.
3. You can only have one group of connected words, That is, a group of connected words cannot be disconnected from another group of connected words.
4. 10 points are scored for each word placed from the word list into a valid crozzle.
5. Each letter at the intersection of two words is awarded points as follows:
   - 1 point for A, E, I, O, U
   - 2 points for B, C, D, F, G
   - 4 points for H, J, K, L, M
   - 8 points for N, P, Q, R
   - 16 points for S, T, V,
   - 32 points for W, X, Y
   - 64 points for Z