Computer Engineering Department

Muğla Sıtkı Koçman University

CENG 2010 Programming Language Concepts, Spring 2021 MIDTERM EXAM HOMEWORK DUE DATE: 29.04.2021 - 23:59 30% OF THE OVERALL GRADE

Send your code via DYS
This is an individual work. No team work is allowed.
Similarity check will be applied to submitted codes.

In your midterm, you are going to write a puzzle solver. Please follow the steps given below in order to prevent any point reduction from your grade.

First of all, check the .txt files shared with you. In each file, the first row includes the number of rows, number of columns, and the number of words to be solved. Starting from the second row of the file, information about each word is given in the order of: its direction, starting row and column number, its name, and finally the hint about the word given to the user. Let's examine puzzle2010.txt:

557

H 1 1 MILK White liquid produced by the mammals

H 2 1 IN Used to indicate inclusion within space, a place, or limits

H 3 3 BUS A road vehicle designed to carry many passengers

H 5 3 DAN The name of a famous author whose surname is Brown

V 1 1 MIND A set of cognitive faculties, e.g. consciousness, perception, etc.

V 3 3 BAD Opposite of good

V 2 5 ISBN International Standard Book Number

In the above example (puzzle2010.txt), we have 5 rows, 5 columns and 7 words. For instance, MILK starts at position 1-1, goes horizontal, and its hint is: White liquid produced by the mammals.

Initially, our puzzle should look like the right image where words to be solved are empty and shown with underscores ('_') while blank areas are shown with #. Row and column numbers together with framing |, * and dashes are also given.

```
Game is 5 rows x 5 cols with 7 words
Words and clues are read!
Current puzzle:

1 2 3 4 5
------
1 | _ _ _ #
2 | _ # # _
3 | _ # _ _ _
4 | _ # _ #
5 | # # _ _ _
**************
```

Below, you can find step-by-step gameplay of puzzle2010.txt. Gameplay with a longer text file and also with an erroneous text file is also given at the end of this document.

```
nter -1 to exit
                                                     Which word to solve next?: 2
                                                      Current hint: Used to indicate inclusion within space, a place,
Game is 5 rows x 5 cols with 7 words
                                                      or limits
Words and clues are read!
                                                     Enter your solution: in
Current puzzle:
                                                     Correct!
          1 2 3 4 5
                                                     Current puzzle:
                      #
                                                                 N
                                                                    #
                                                                        #
                                                                  #
                                                               #
                                                                  #
Ask for hint:
  Direction
                 row col
                                                     Ask for hint:
1: Horizontal
                                                        Direction
                                                                      row col
2: Horizontal
3: Horizontal
                                                     3: Horizontal
4: Horizontal
                                                     4: Horizontal
5: Vertical
                                                     5: Vertical
6: Vertical
                                                     6: Vertical
7: Vertical
                                                     7: Vertical
Enter -1 to exit
                                                     Enter -1 to exit
Which word to solve next?: 1
                                                     Which word to solve next?: 3
Current hint: White liquid produced by the mammals
                                                     Current hint: A road vehicle designed to carry many passengers
Enter your solution: milk
                                                     Enter your solution: bus
Correct!
                                                     Correct!
Current puzzle:
                                                     Current puzzle:
          1 2 3 4 5
                                                               1 2 3 4 5
                                                             | M I L K #
                #
                   #
                                                                  #
                                                               #
                                                     Ask for hint:
Ask for hint:
                                                       Direction
                                                                      row col
# Direction
                 row col
                                                     4: Horizontal
2: Horizontal
                                                     5: Vertical
3: Horizontal
                                                     6: Vertical
4: Horizontal
                                                     7: Vertical
5: Vertical
6: Vertical
                                                     Enter -1 to exit
7: Vertical
                                                      Which word to solve next?: 4
```

```
Current hint: The name of a famous author whose surname is Brown
Enter your solution: dan
Correct!
Current puzzle:
       | M I L K #
       | _ # B U S
       |_ # _ # _
| # # D A N
                                                         Current puzzle:
Ask for hint:
Direction
                                                                 | M I L K #
5: Vertical
6: Vertical
                                                                 | I N # #
7: Vertical
                                                                 N # B U S
                                                         4
                                                                 D # A #
Enter -1 to exit
                                                                 | # # D A N
Which word to solve next?: 5
                                                                 *********
Current hint: A set of cognitive faculties, e.g. consciousness,
perception, etc.
                                                         Ask for hint:
Enter your solution: mind
                                                          # Direction
                                                                        row col
Correct!
                                                          7: Vertical 2 5
Current puzzle:
                                                          Enter -1 to exit
                                                          Which word to solve next?: 7
                                                          Current hint: International Standard Book Number
       | M I L K #
      Enter your solution: isbn
                                                         Correct!
                                                         Current puzzle:
Ask for hint:
 Direction
              row col
                                                                 | M I L K #
6: Vertical
                                                                 | I N # # I
7: Vertical
                                                                 | N # B U S
                                                         4
                                                                 D # A # B
Enter -1 to exit
Which word to solve next?: 6
                                                                 # # D A N
Current hint: Opposite of good
Enter your solution: bad
                                                          Congratulations! You beat the puzzle!
Correct!
```

First of all, include below struct and function declarations in your code.

```
typedef struct
{
    char *word; //word and corresponding hint
    char *clue;
    int x; //Starting x and y positions
    int y;
    char direction; //H for horizontal, V for vertical
    int f; //solved or not
} Word_t* loadTextFile( FILE* myFile, int nrWords );
void displayBoard(int rows, int cols, char** myBoard);
int isBoardFilled(int rows, int cols, char** myBoard);
char** createArray(int rows, int cols);
int findIndex(int arr[], int size, int val);
void playGame(char** myBoard, int words, Word_t *words, int x, int y, int countToFinish);
char** updateBoard(char** myBoard, Word t *words, int solve);
```

Function explanations (you can add more variables to each function and add more functions to your code if you need):

- main:
 - declarations you may need:
 - **4** a dynamic array of board (e.g. char** board)
 - 4 a file pointer to the file
 - number of rows, columns and words
 - a dynamic array of Word_t type
 - functionality
 - get the name of the file from the user and open the file
 - read number of rows, columns and words
 - dynamically allocate your Word_t type array in the size of words
 - call loadTextFile function and assign the returned array to your Word_t type array
 - call createArray and assign the result to your board
 - call playGame
 - free any dynamically allocated array
- loadTextFile:
 - Create a temporary Word_t type array and dynamically allocate it using the number of words
 - For each element of this array, read the direction, row-column starting numbers, word to be solved and its hint from the file.
- createArray:
 - Dynamically allocate a temporary board array (remember the dynamic memory allocation of 2D arrays from the lecture. First allocate memory for number of rows, then for each row, allocate memory for columns)
 - > Initialize all elements of the array to '#'
- displayBoard:
 - Traverse the column array and display the column number
 - Traverse the column array and print dashes as separators
 - > Print row numbers followed by '|' and print corresponding board element

- isBoardFilled:
 - ➤ If there is any blank in the table (e.g. '_'), return 0, else return 1
- findIndex:
 - > Return 1 if the given value is found.
- updateBoard:
 - ➤ This function inserts the element with the index:solve into the board.
 - ➤ If the word is solved, insert the word. Else, put underscores ('_') in the length of this word.
- playGame:
 - Initially, update and display the board.
 - Now, create a loop in which the game is played. Game finishes whenever gameOver reaches to the number of total words or whenever there is no more blanks in the board.
 - For each word, display the associated direction, row, column info if it is not solved before
 - Ask the user to enter a word number
 - Check the validity of the input (solved before, or valid in range, etc.)
 - Show hint
 - Get the answer
 - If correct, increment gameOver counter, update the board and display the board.
 - Check whether the board is filled or not.

Step-by-step gameplay of puzzle2010long.txt

Ask for hint:

```
# Direction
                                                                    row col
Game is 6 rows x 6 cols with 14 words

    Horizontal

Words and clues are read!
                                                   Horizontal
                                                                           4
Current puzzle:
                                                   4: Horizontal
                                                   5: Horizontal
                                                                           1
         1 2 3 4 5 6
                                                   6: Horizontal
                                                   7: Horizontal
                                                   8: Horizontal
                                                                    6
                                                   9: Vertical
                                                   10: Vertical
                                                                           2
                                                   11: Vertical
                                                   12: Vertical
                                                   13: Vertical
                                                   14: Vertical
Ask for hint:
                                                   Enter -1 to exit
# Direction
               row col
                                                   Which word to solve next?: 7
                                                   Current hint: Internet country code of Turkey
1: Horizontal 1 1
2: Horizontal 1 4
                                                   Enter your solution: TR
3: Horizontal
                                                   Correct!
4: Horizontal
                      1
5: Horizontal
                4
                                                   Current puzzle:
6: Horizontal
7: Horizontal
8: Horizontal
               6
9: Vertical
10: Vertical
                4
11: Vertical
12: Vertical
13: Vertical
14: Vertical
Enter -1 to exit
Which word to solve next?: 3
                                                   Ask for hint:
Current hint: Opposite of push operation in stacks
                                                   # Direction
                                                                   row col
Enter your solution: pop
                                                   1: Horizontal 1
2: Horizontal 1
Correct!
                                                                           4
                                                   4: Horizontal
Current puzzle:
                                                   5: Horizontal
                                                                    4
                                                   6: Horizontal
                                                   8: Horizontal
                                                   9: Vertical
                                                   10: Vertical
                                                   11: Vertical
                                                   12: Vertical
                                                                           4
                                                   13: Vertical
                                                   14: Vertical
                                                   Enter -1 to exit
```

| Ask for hint: | Ask for hint: |
|--|---|
| # Direction row col | # Direction row col |
| | 4. 11 |
| 1: Horizontal 1 1 | 1: Horizontal 1 1 2: Horizontal 1 4 |
| 2: Horizontal 1 4 | 4: Horizontal 3 3 |
| 4: Horizontal 3 3 | 5: Horizontal 4 1 |
| 5: Horizontal 4 1 | 6: Horizontal 5 1 |
| 6: Horizontal 5 1 | 8: Horizontal 6 5 |
| 8: Horizontal 6 5 | 9: Vertical 1 1 |
| 9: Vertical 1 1 | 10: Vertical 4 2 |
| 10: Vertical 4 2 | 11: Vertical 2 3 |
| 11: Vertical 2 3 | 12: Vertical 1 4 |
| 12: Vertical 1 4 | 13: Vertical 1 5 |
| 13: Vertical 1 5 14: Vertical 5 5 | 14: Vertical 5 5 |
| 14: Vertical 5 5 | |
| Enter -1 to exit | Enter -1 to exit |
| Which word to solve next?: 1 | Which word to solve next?: 9 |
| Current hint: Symbol of Sodium element | Current hint: Opposite direction of south |
| Enter your solution: NB | Enter your solution: NORTH |
| WRONG ANSWER | |
| Current puzzle: | Correct! |
| carrent pazzzer | |
| 1 2 3 4 5 6 | Current puzzle: |
| | 4 2 3 4 5 6 |
| 1 _ # | 1 2 3 4 5 6 |
| 2 # P O P # | 1 IN # |
| 3 # _ # # | 1 N _ # 2 O # P O P # |
| 4 # # | 2 0 # F 0 F # 3 R # # # |
| 5 _ # # T R | 4 T |
| 6 # # # # | 5 H # # T R |
| *********** | 6 # # # # |
| | ********* |
| Ask for hint: | |
| # Direction row col | Ask for hint: |
| | # Direction row col |
| 1: Horizontal 1 1 | |
| 2: Horizontal 1 4 | 1: Horizontal 1 1 |
| 4: Horizontal 3 3 | 2: Horizontal 1 4 |
| 5: Horizontal 4 1 | 4: Horizontal 3 3 |
| 6: Horizontal 5 1 | 5: Horizontal 4 1 |
| 8: Horizontal 6 5 | 6: Horizontal 5 1 |
| 9: Vertical 1 1 | 8: Horizontal 6 5 |
| 10: Vertical 4 2 | 10: Vertical 4 2 |
| 11: Vertical 2 3 | 11: Vertical 2 3 |
| 12: Vertical 1 4 | 12: Vertical 1 4 |
| 13: Vertical 1 5 | 13: Vertical 1 5 |
| 14: Vertical 5 5 | 14: Vertical 5 5 |

Enter -1 to exit

Enter -1 to exit

```
Which word to solve next?: 2
Ask for hint:
# Direction row col
                                      Current hint: A road vehicle designed to carry many
                                      Enter your solution: bus
1: Horizontal 1
                       1
                      4
2: Horizontal
               1
                                      Correct!
4: Horizontal
               3
               4 1
5 1
5: Horizontal
                                      Current puzzle:
6: Ho.
8: Horizonta.
10: Vertical
Vertical
6: Horizontal
                     5
               6
               4 2
2 3
1 4
                                              N A # B U S
                                             0 # P O P #
13: Vertical
               1
                     5
                                             | R # _ _ # #
14: Vertical
               5
                      5
                                             | T _ _ #
                                                         # #
                                                    _ _ # #
# # T R
Enter -1 to exit
                                             # # # # _
Which word to solve next?: 1
Current hint: Symbol of Sodium element
Enter your solution: na
                                      Ask for hint:
                                      # Direction row col
Correct!
                                      4: Horizontal 3
5: Horizontal 4
Current puzzle:
                                                           1
                                      6: Horizontal
                                                    5
                                                           1
         1 2 3 4 5 6
                                      8: Horizontal 6
10: Vertical 4
11: Vertical 2
                                                            2
       N A #
       0 # P O P #
                                      12: Vertical
                                                     1
       R # _ _ # #
                                      13: Vertical
                                                     1
       | T _
                                      14: Vertical
                                                     5
                                                            5
              # # T R
       | H _ # #
| # # # #
                                      Enter -1 to exit
       ************
                                      Which word to solve next?: 4
                                      Current hint: Abbrev. Nuclear Sclerosis
Ask for hint:
                                      Enter your solution: NS
# Direction row col
                                      Correct!
2: Horizontal 1
                       4
4: Horizontal
               3
                                      Current puzzle:
5: Horizontal
               4
6: Horizontal
8: Horizontal
               5
                    5
2
3
               6
                                             NA#BUS
10: Vertical
               4
                                      2
3
4
                                             10 # P O P #
11: Vertical
               2
                                             R # N S # #
12: Vertical
               1
                                             13: Vertical
                      5
                                                         # #
               1
                                                         T R
                      5
               5
14: Vertical
```

Enter -1 to exit

```
Ask for hint:
                                 Current puzzle:
 Direction row col
                                          1 2 3 4 5 6
5: Horizontal 4 1
6: Horizontal
              5
                    1
                                         NA#BUS
                   5
8: Horizontal
                                         10 # P O P #
10: Vertical
             4
                   2
                                          R # N S # #
11: Vertical
              2
                   3
                                        T 0 S S # #
12: Vertical
              1
                    4
13: Vertical
                   5
                                        | H R # # T
             1
14: Vertical
                    5
                                        *************
Enter -1 to exit
Which word to solve next?: 5
                                 Ask for hint:
Current hint: To throw up in the air
                                   Direction
                                               row col
Enter your solution: toss
                                 8: Horizontal 6 5
Correct!
                                 10: Vertical
                                                4
                                                      2
                                                2
                                 11: Vertical
                                                      3
Current puzzle:
                                 12: Vertical
                                                1
                                                      4
                                 13: Vertical
                                                1
                                                      5
       1 2 3 4 5 6
                                 14: Vertical
                                                5
       NA#BUS
                                 Enter -1 to exit
      10 # P O P #
      | R # N S # #
                                 Which word to solve next?: 6
      T 0 S S # #
                                 That word has been solved before
      | H # # T R
                                 Enter -1 to exit
      # # # #
                                 Which word to solve next?: 8
      ************
                                 Current hint: Symbol of Silver element
                                 Enter your solution: AG
Ask for hint:
Direction
             row col
                                 Correct!
6: Horizontal 5 1
                                 Current puzzle:
8: Horizontal
             6
                   5
                    2
10: Vertical
              4
                                          1 2 3 4 5 6
11: Vertical
              2
12: Vertical
             1
                   4
13: Vertical
                    5
             1
                                        INA#BUS
                                        0 # P O P
14: Vertical
                                        | R # N S # #
Enter -1 to exit
                                         | T 0 S S # #
Which word to solve next?: 6
                                        H R # # T R
Current hint: Abbrev. Human Resources
                                        | # # #
                                                  #
                                                     A G
Enter your solution: HR
                                 Congratulations! You beat the puzzle!
Correct!
```

Problem with the puzzlewrong.txt

Direction

row col

```
2: Horizontal
                                                                        2
                                                       3: Horizontal
                                                       4: Horizontal
                                                       5: Vertical
                                                       6: Vertical
                                                       7: Vertical
CMPE252 HW1 PUZZLE GAME
                                                       Enter -1 to exit
                                                       Which word to solve next?: 5
Enter name of text file: puzzleWrong.txt
                                                       Current hint: Red planet
Game is 5 rows x 5 cols with 7 words
                                                       Enter your solution: mars
Words and clues are read!
Current puzzle:
                                                       Correct!
            2 3 4 5
                                                       Current puzzle:
                                                                1 2 3 4 5
                                                                М
                                                                   I L K #
                                                                Α
                                                                      #
                                                                R
                                                                   #
                                                                   #
Ask for hint:
# Direction
                row col
                                                       Ask for hint:
1: Horizontal
                                                        Direction
                                                                       row col
2: Horizontal
                2
3: Horizontal
                                                       2: Horizontal
4: Horizontal
                                                       3: Horizontal
                                                       4: Horizontal
5: Vertical
                                                       6: Vertical
6: Vertical
7: Vertical
                                                       7: Vertical
                                                                        2
                  2
                                                       Enter -1 to exit
Enter -1 to exit
                                                       Which word to solve next?: 2
Which word to solve next?: 1
                                                       Current hint: Used to indicate inclusion
Current hint: White liquid produced by the mammals
                                                       within space, a place, or limits
Enter your solution: milk
                                                       Enter your solution: in
Correct!
                                                       Correct!
Current puzzle:
                                                       Current puzzle:
          1 2 3 4 5
                                                                1 2 3 4
         М
                                                                   Ν
                                                                   #
             #
                                                                   #
          #
            #
                                                                   #
```

The program does not have to check the final condition of the word entered before (e.g. MARS \rightarrow MIRS). Therefore, assume that .txt files are prepared correctly.